PHOENIX CONTACT
SOUTHEAST ASIA

Importance of Power Reliability

Mr Simon Low

Regional Sales Product Marketing Manager

Phoenix Contact Southeast Asia

Input Power

Power Failure
Power Sags/Dips
Switching Transient
Power surge
Under/Over Voltage

Loads

Overload
Short-Circuit
Total Power Lost

Pre-emptive Measures

Diagnostic Info
Preventive Info
Predictive Info

KEY TO POWER RELIABILITY

Photo By Kane Quinnell
21:38 14 January 2005

Sources of disturbances

LEMP

Lightning Electromagnetic Pulse
Extremely high surge voltages
Damage via direct strike or inductive coupling

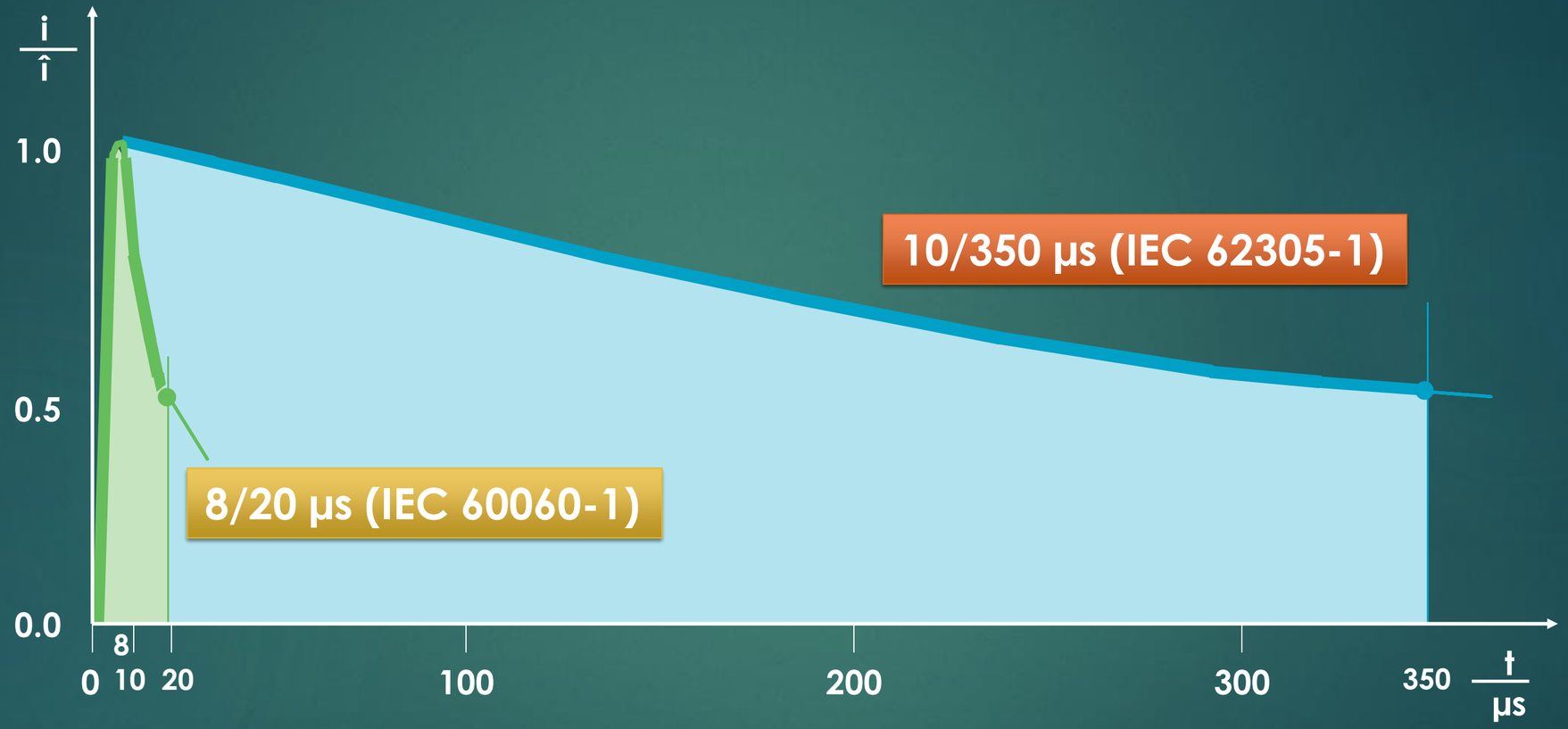
SEMP

Switching **E**lectro**m**agnetic **P**ulse
Switching of high-capacity machines
Short circuits in the power supply network
Occurrence of extremely high current changes

ESD

Electrostatic **D**ischarge
Discharge between bodies
Generally, not harmful to human beings, but damaging to sensitive electronics

Surge current Comparison (SEMP vs LEMP)

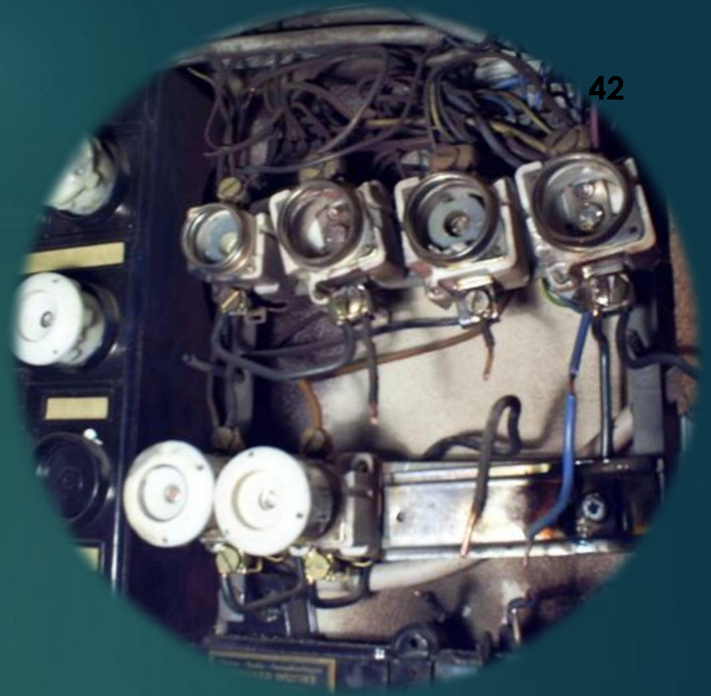


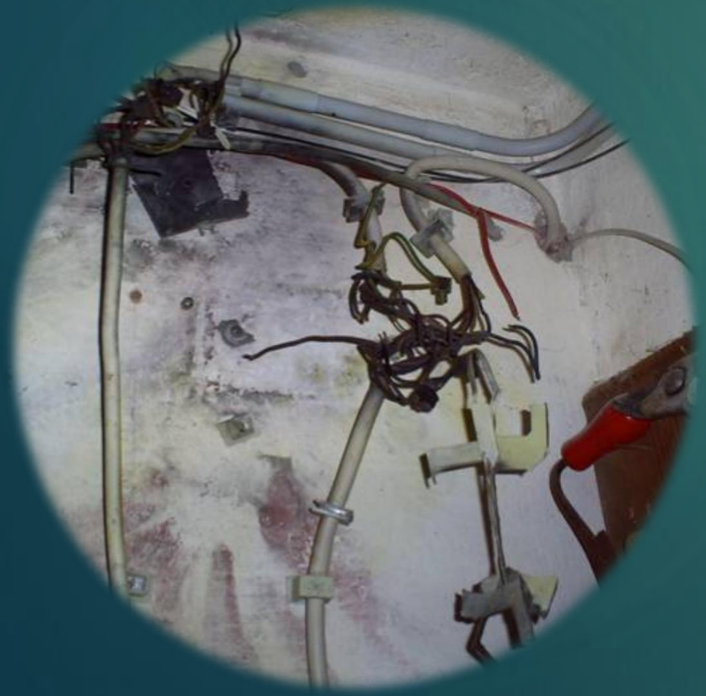
LEMP

Junction Box

First Floor

Main Distribution Panel



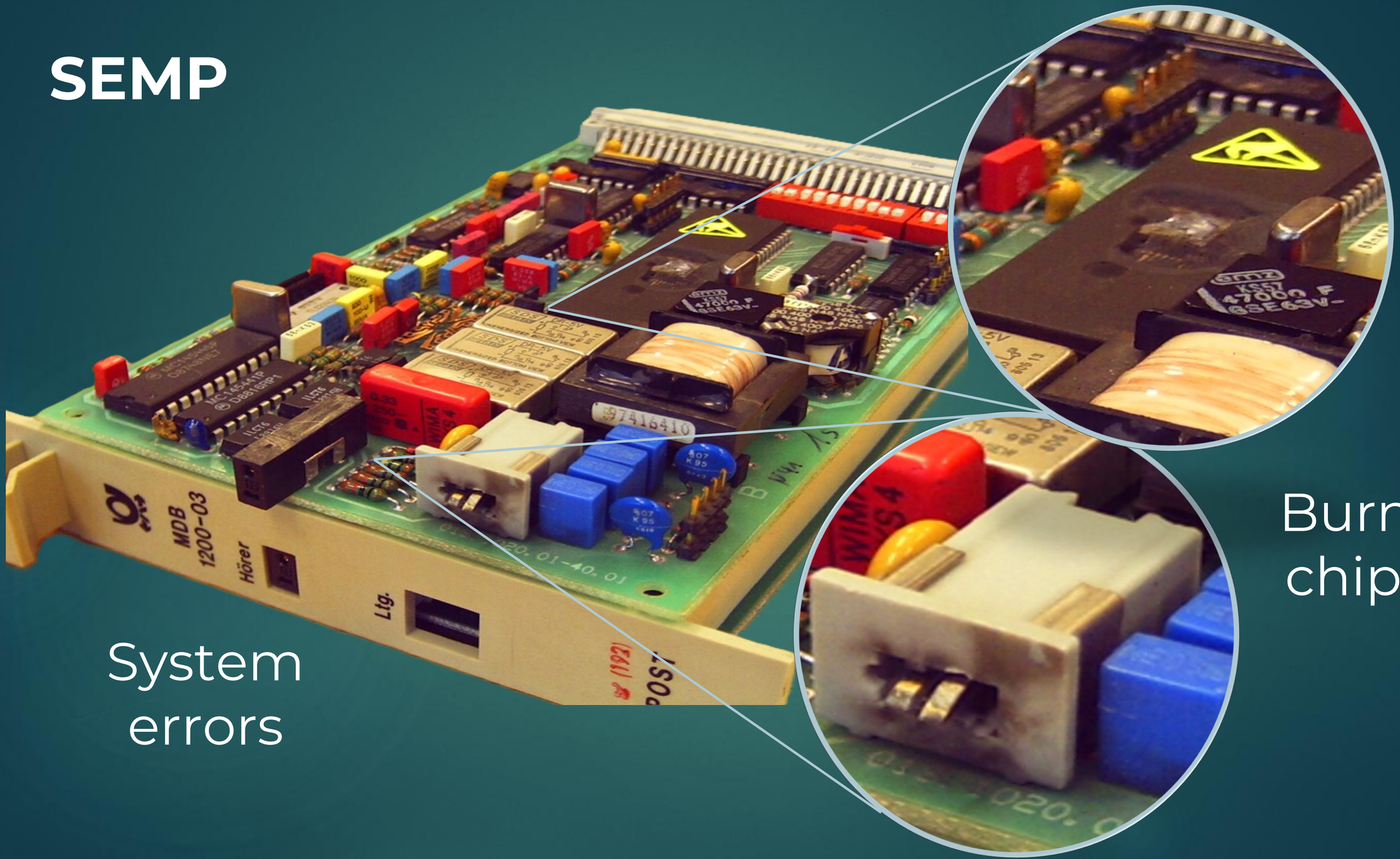


Junction Box

Basement

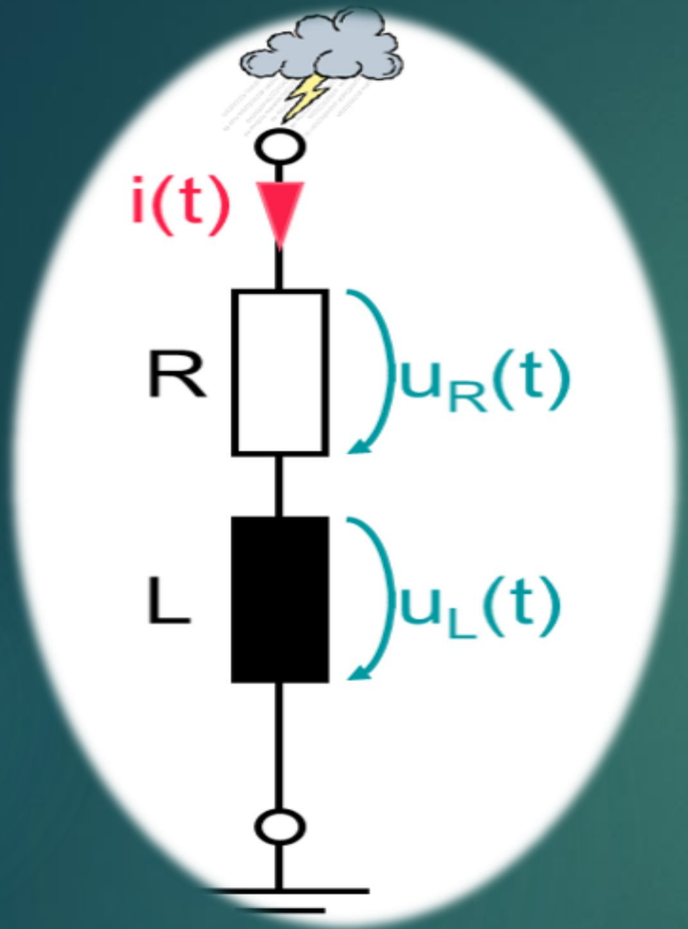
Residual Current Device

SEMP



Coupling Mechanisms

Coupling Mechanisms

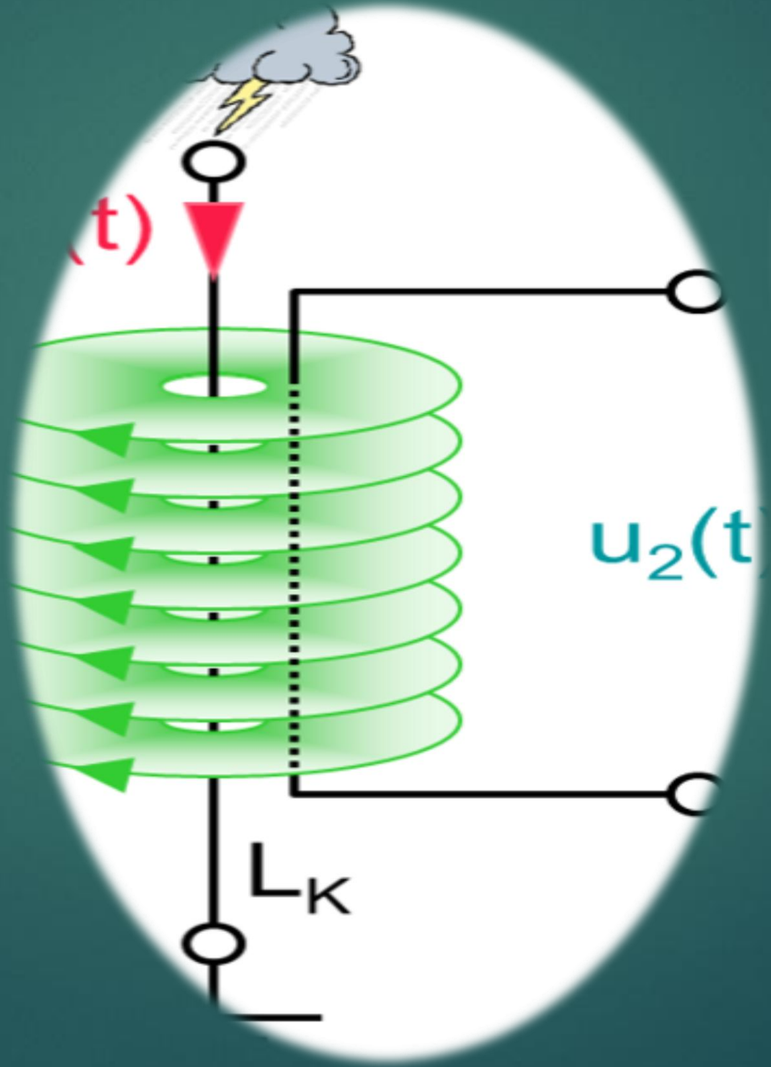


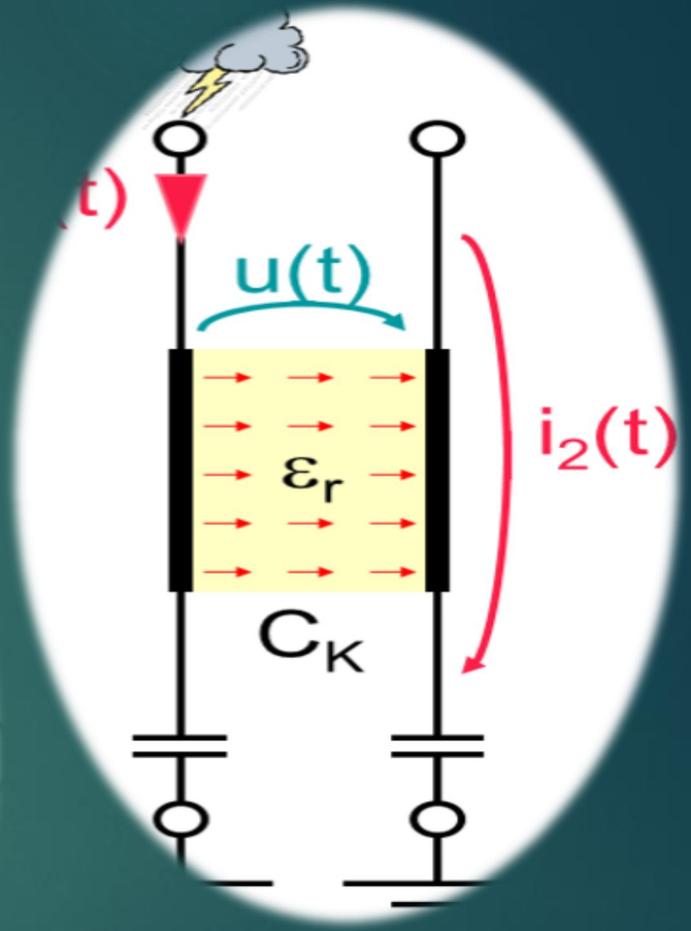
Galvanic

Everything that couples directly into circuit.

Inductive

Through the magnetic field of another conductor.

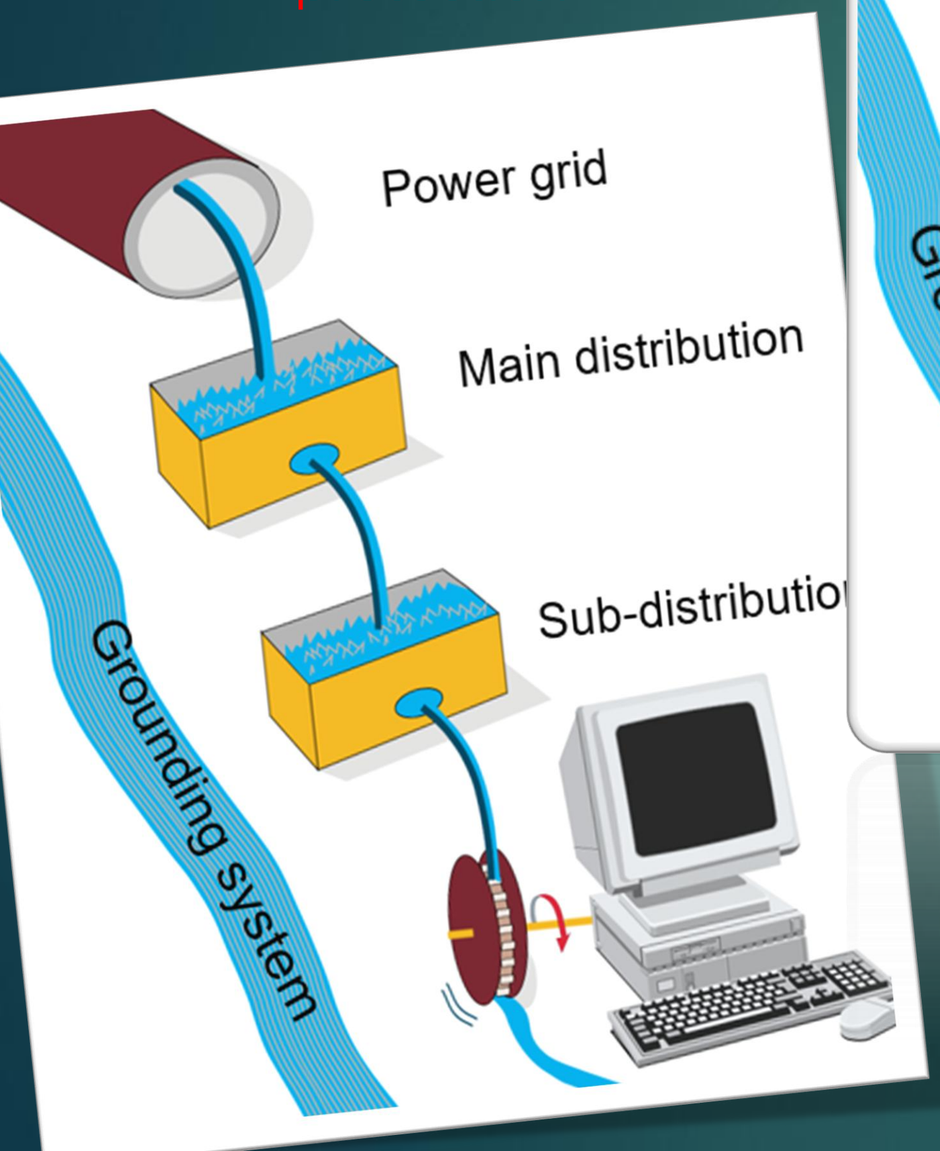


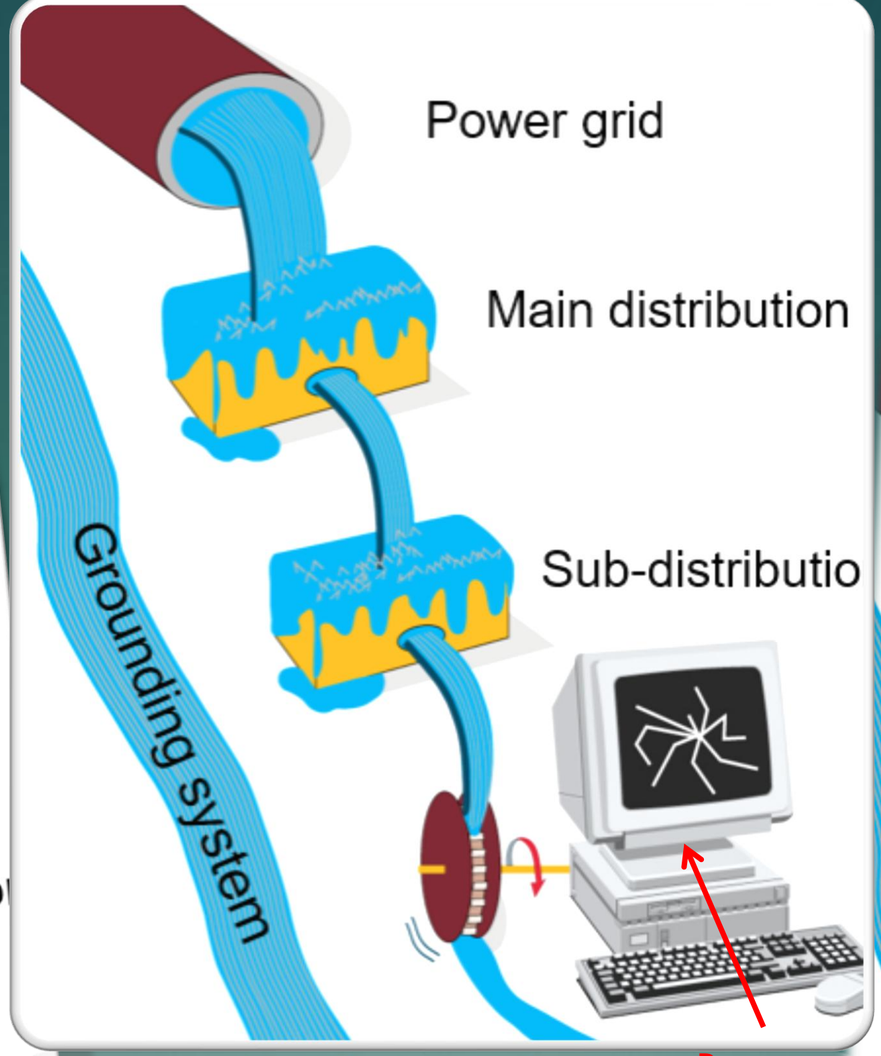


Capacitive

Through electrical field between two points with a high potential difference

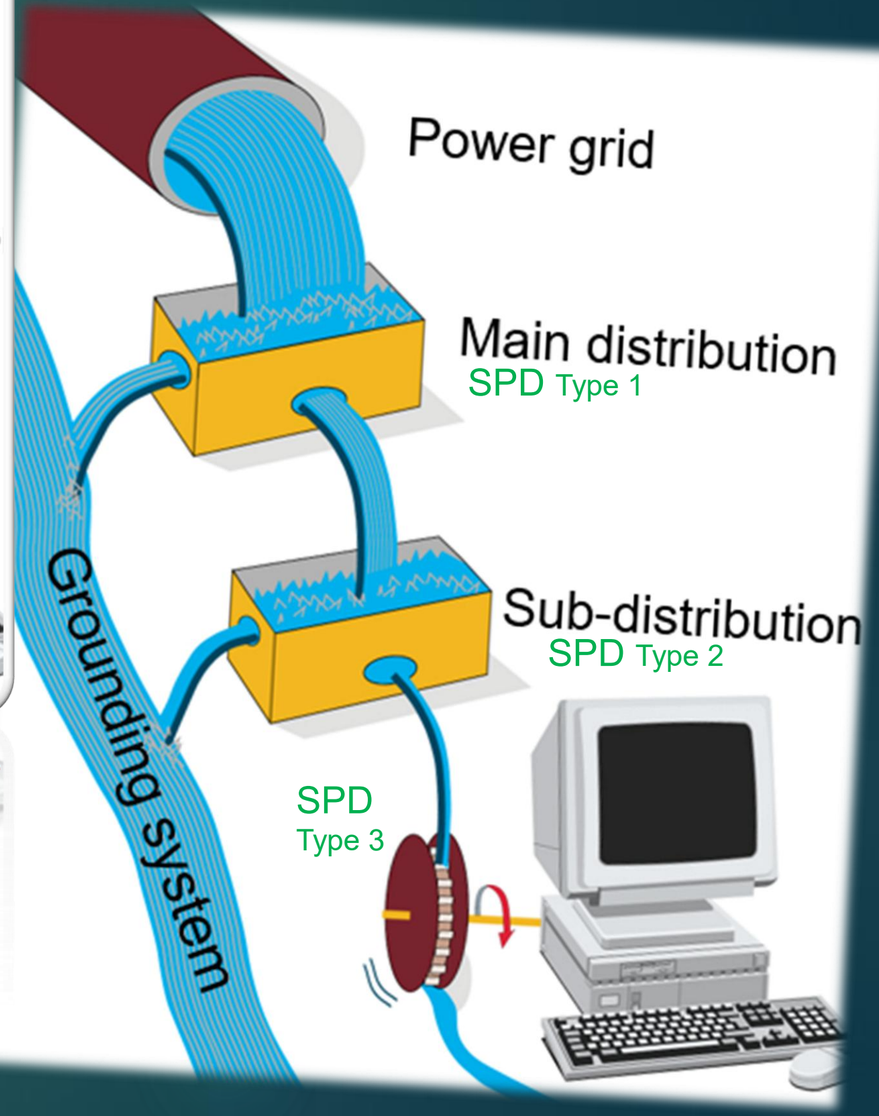
Normal Operation
Without Surge protection



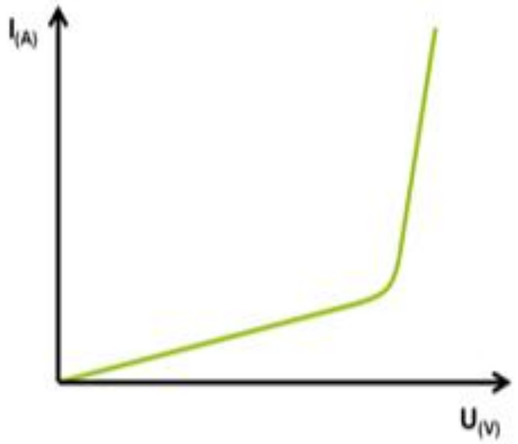


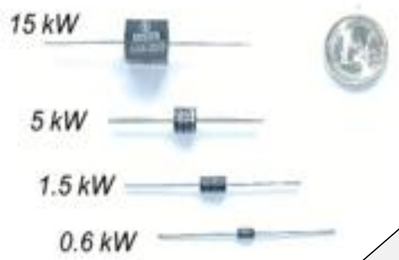
Excess of Water
Without Surge protection

Excess of Water
With Surge Protection

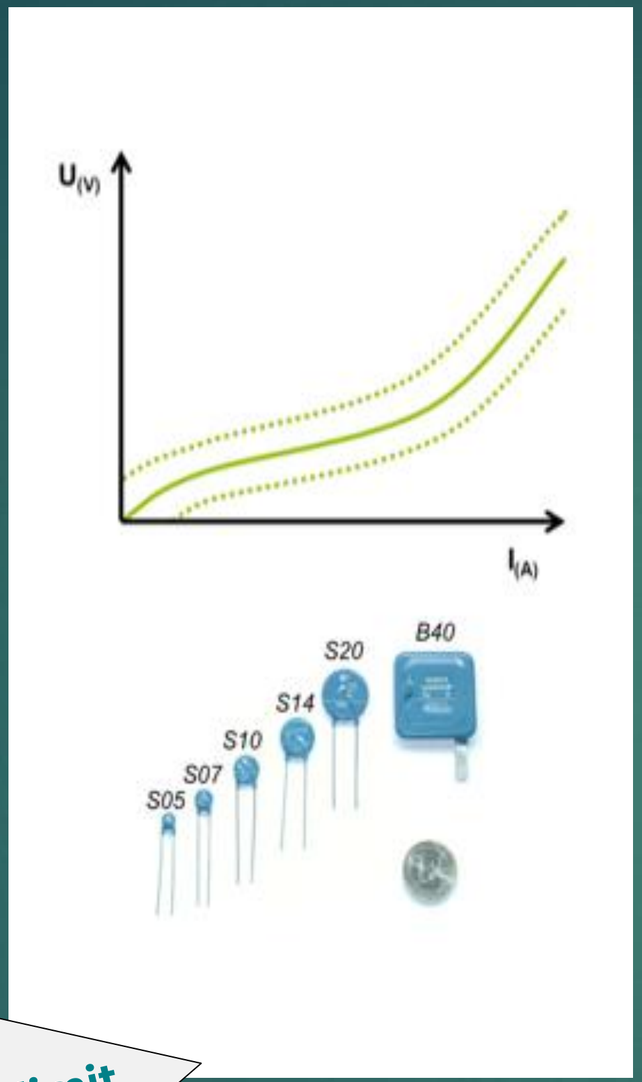


Suppressor Diode



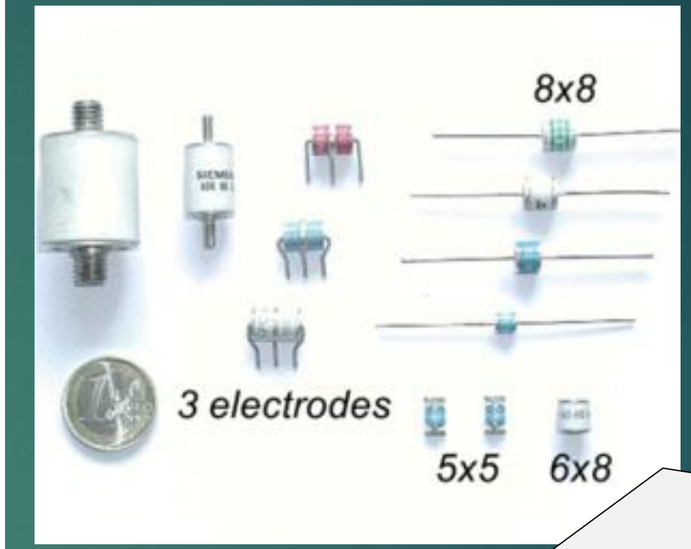


Voltage limit



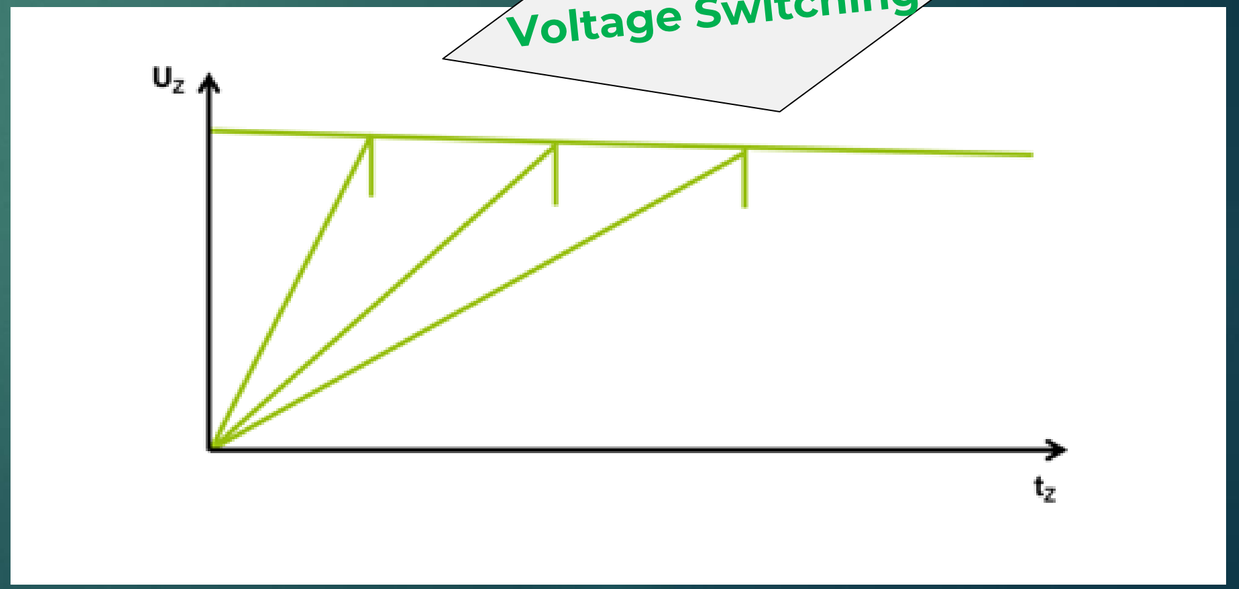
Varistor

Gas Discharge Tube



Spark Gap

Voltage Switching

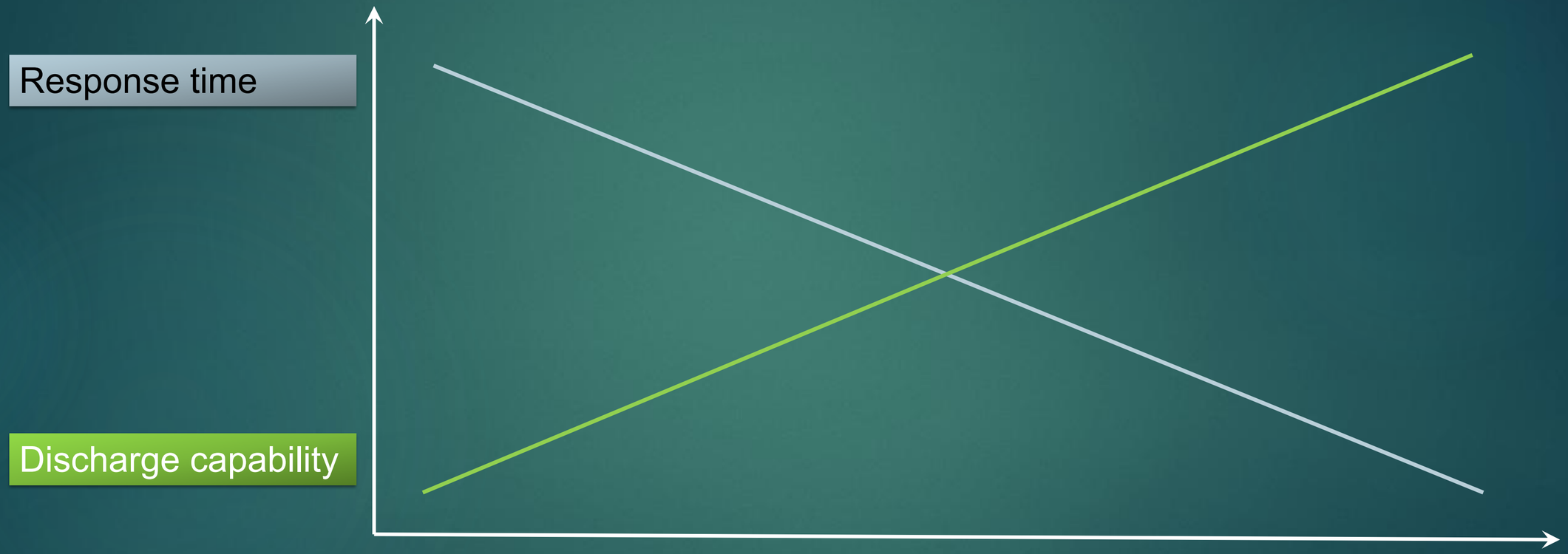


Suppressor Diode

Varistor

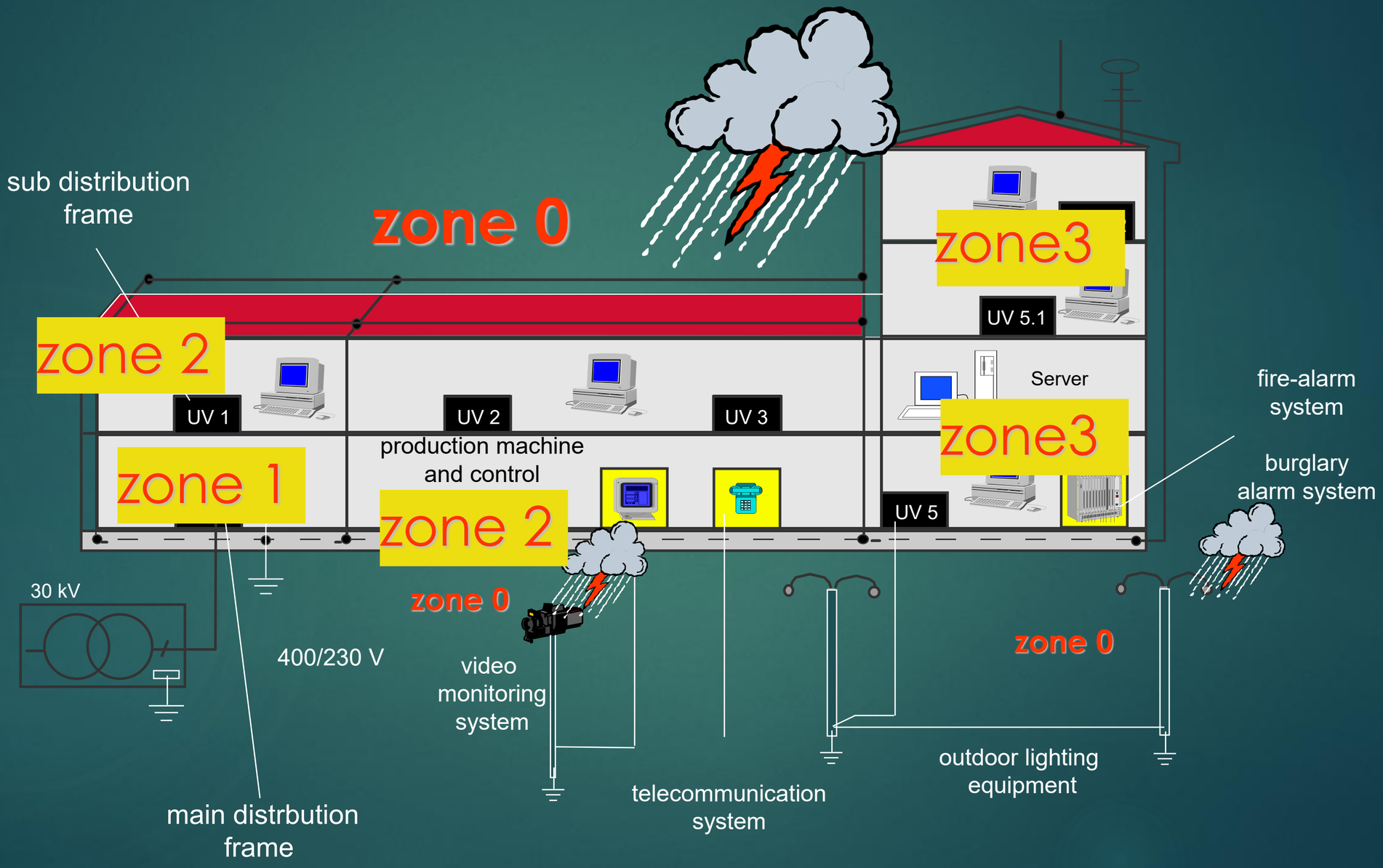
Gas Discharge Tube

Spark Gap



Components

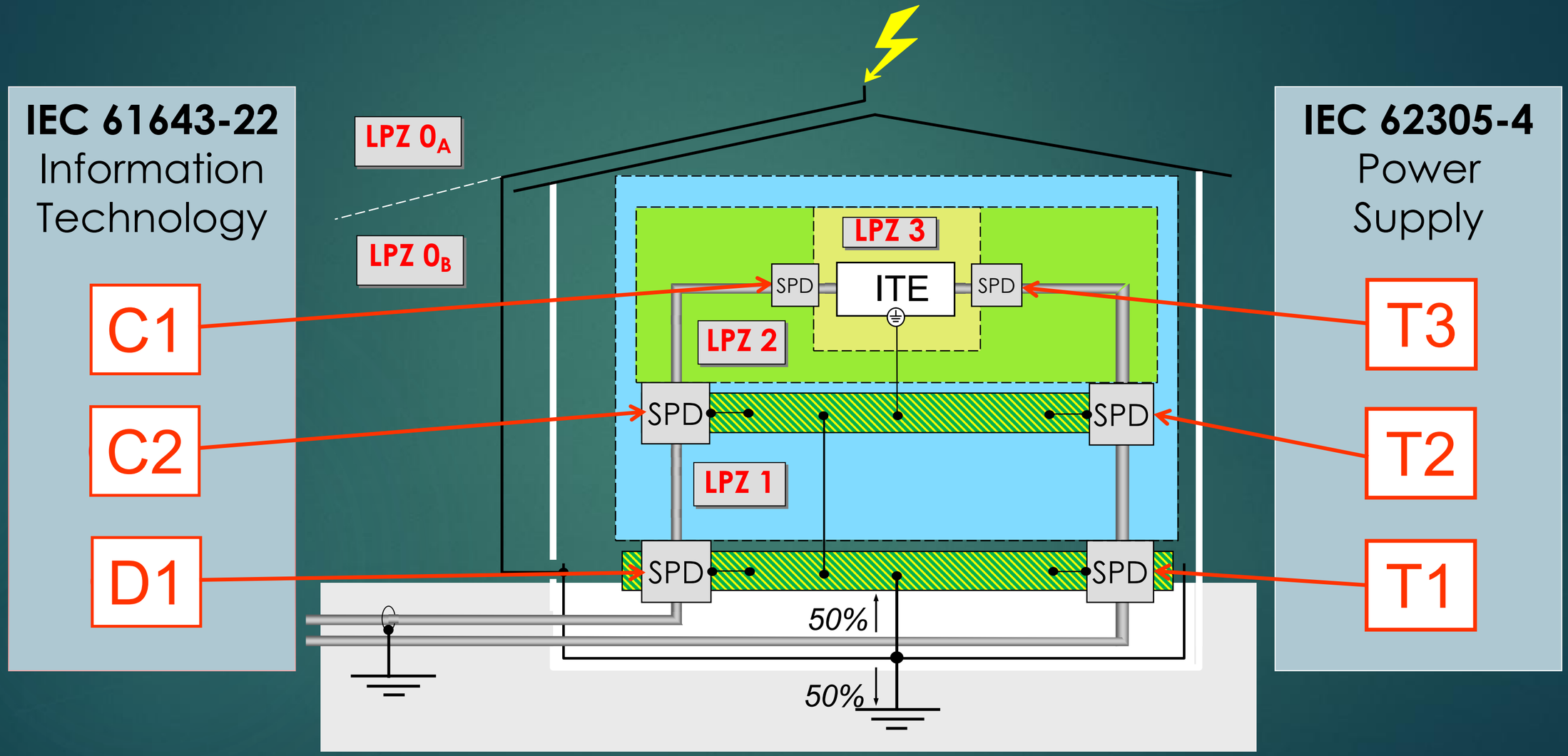
Lightning protection zones LPZ



Lightning protection zones LPZ

ZONE 0	Outdoors; Direct lightning strike possible; no shielding against LEMP; **Lightning Protection Zone 0 (LPZ 0)**	
ZONE 1	Indoors; High-energy transients caused by switching operation (SEMP); partial lightning currents; **Lightning Protection Zone 1 (LPZ 1)**	Type1 SPD
ZONE 2	Indoors; Low-energy transients caused by switching operation (SEMP); electrostatic discharges (ESD); **Lightning Protection Zone 2 (LPZ 2)**	Type2 SPD
ZONE 3	Indoors; no generation of transient currents and voltages which exceed the insulation of electrical and electronic equipment; shielding and separate routing of circuits which may influence each other; **Lightning Protection Zone 3 (LPZ 3)**	Type3 SPD

Lightning protection zones LPZ

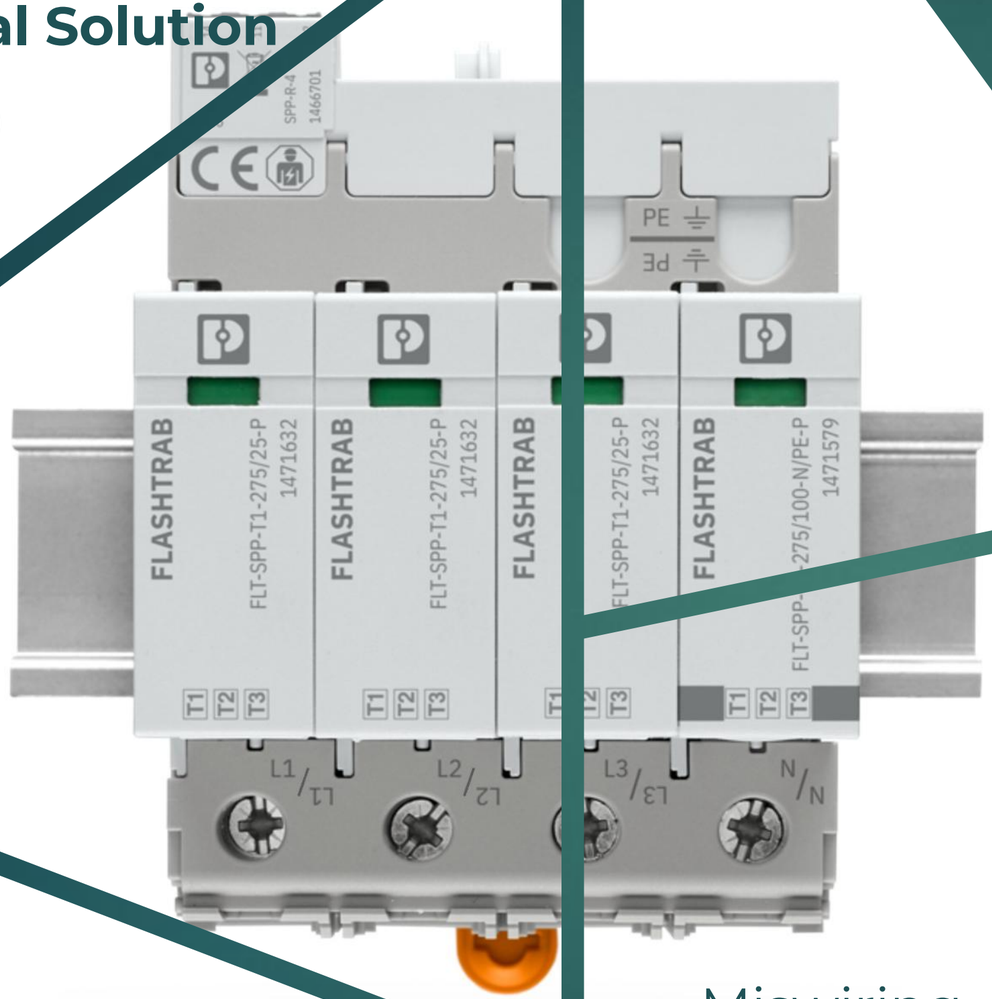


Safe Protection Plus

Simple and Safe in Installation and Operation

PHOENIX CONTACT

Type 1+2+3
Universal Solution
SPD



FLT-SPP SPD 53

Carbon Spark Gap

Double insulation between main and auxiliary circuits

Multiimpulse capability

Maximum discharge capacity 100kA I_{total}

Simple and individually pluggable

IEC 61643: 2025

Certified by DEKRA

Lower torque drive → 3 Nm

No line follow current (LFC)

Miswiring and Touch protection

Max. backup fuse of 315A

VAL-SPP SPD [54]

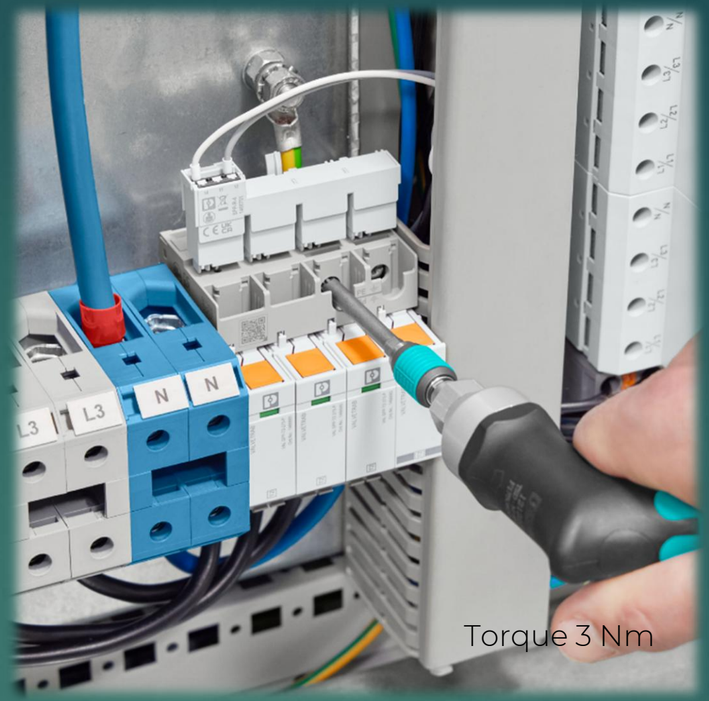
Type 2 SPD

Modular remote contact

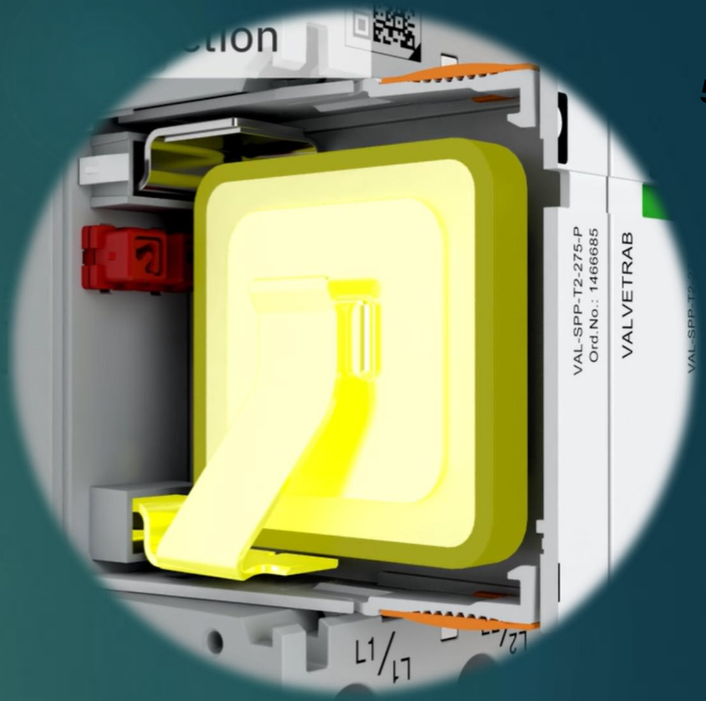
Optical status indicator

Type 1 and Type 2 SPD
For PV application

Miswiring, Touch protection

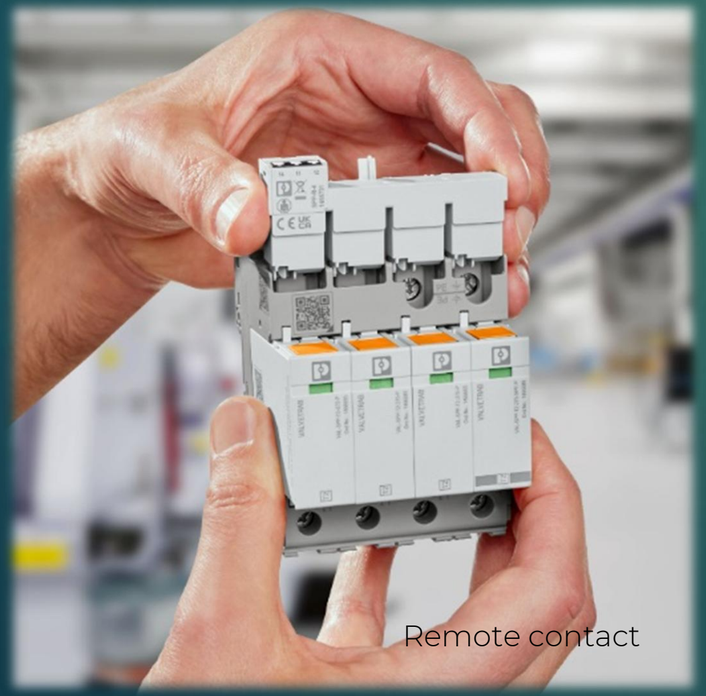


Torque 3 Nm

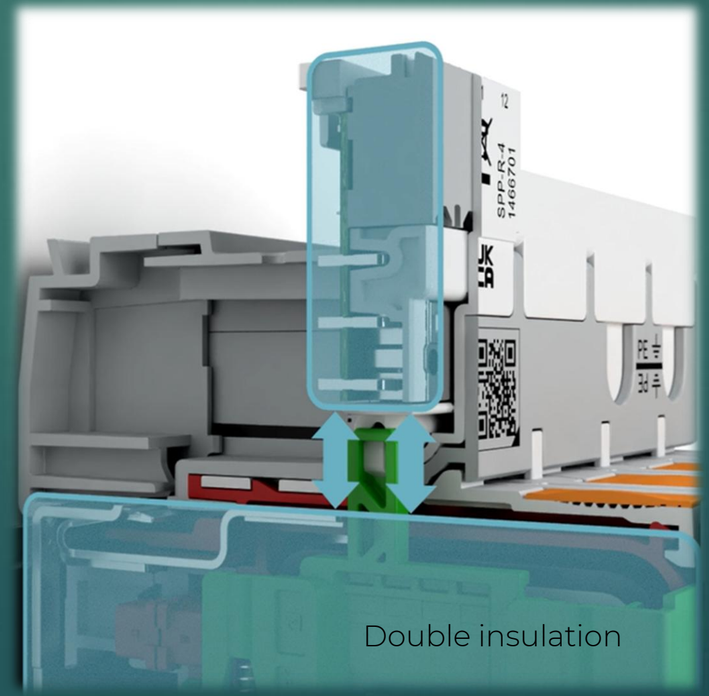


Operational Safety

Rapid disconnect



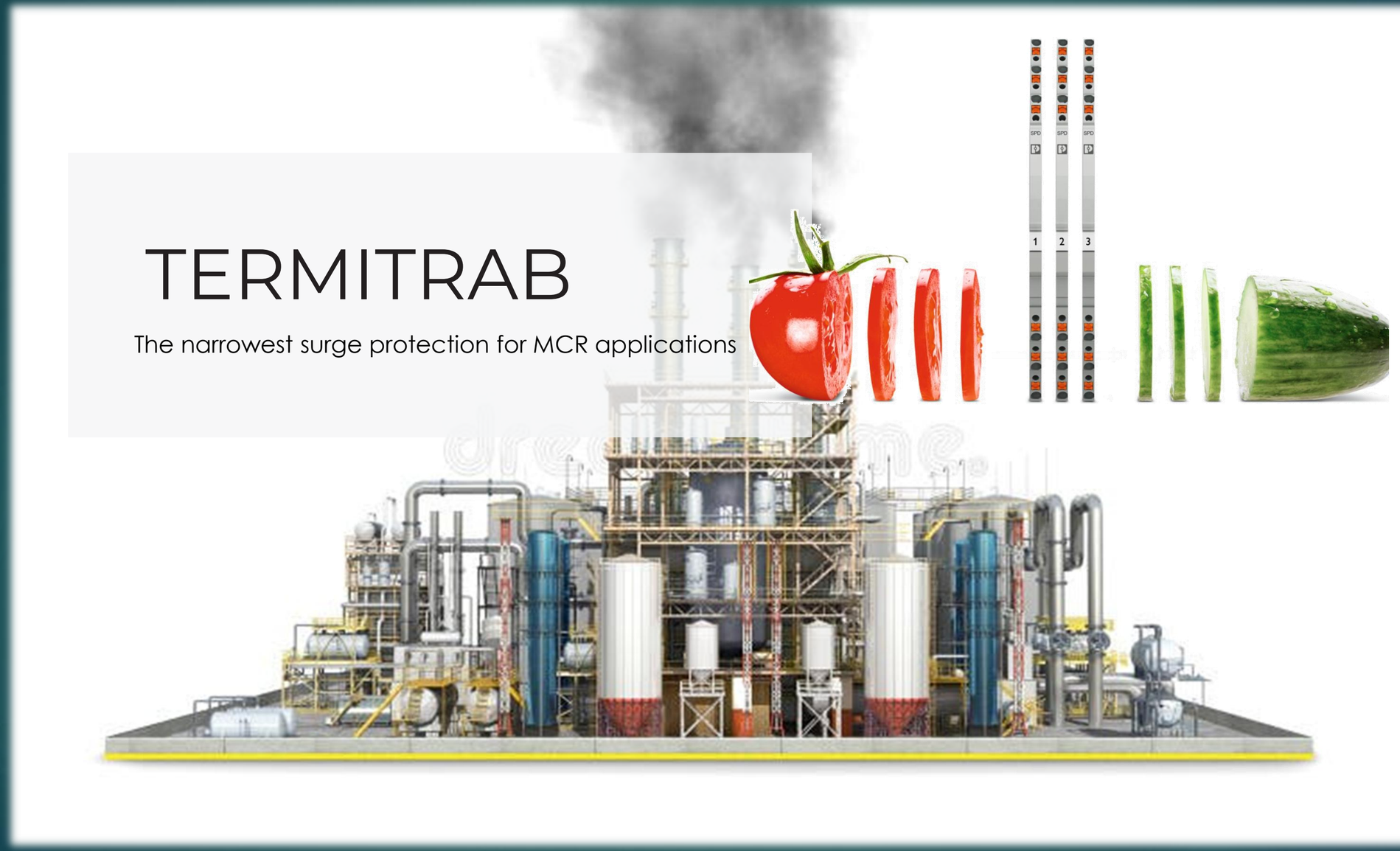
Remote contact



Double insulation

Growing Solar/PV Application

Termitrab TTC SPD



Termitrab TTC SPD

Extremely narrow width

Space saving, starting from 3.5mm
Protect 572 signal lines in 1 meter

Wide product range

MCR application

Push-in or Screw connection

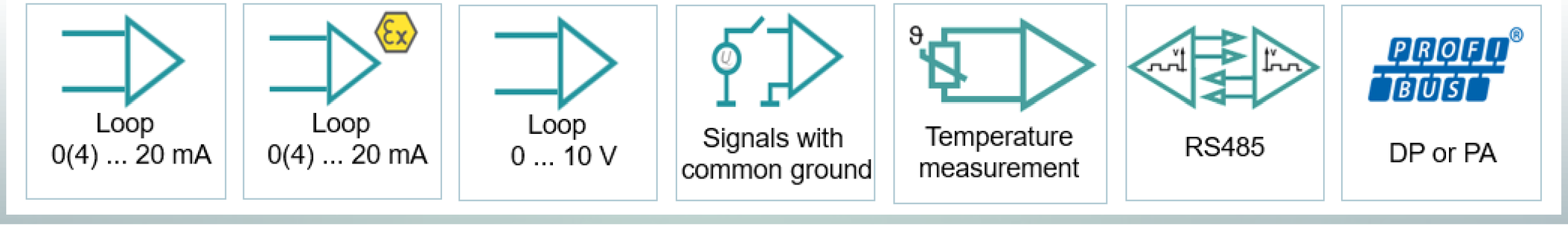
Optional Remote Signal

Easy monitoring up to 40 TTC modules per group

Status Indication

Floating contact
Mechanical device

Termitrab TTC SPD



Overvoltage protection

SYSTEM Reliability

Power Reliability

System Disruptions

StarHub
3 hrs ·

[Update #2: 9:53pm]

We are sorry for the inconvenience caused by the incident this evening.

Mobile data services for customers are fully restored. We have restored most of the affected fixed internet connections.

We would like to thank our customers for their patience and understanding.

[Update #1: 6:56pm]

Our engineers are working hard and we are progressively restoring services. Some customers may experience temporary data congestion. Please try restarting your devices to refresh data connection.

Dear customers
We have received reports of issues with internet access and we are investigating. We will provide an update as soon as we can.

VPN Connection Failure

VPN connection failed. Please check your configuration, network connection and pre-shared key then retry your connection. If the problem persists, contact your netw

Singtel
52 mins ·

Some customers may be experiencing difficulty accessing the internet. Our engineers are investigating and we will provide updates as more information comes in. Thank you for your patience.

M1
@M1Singapore

Customers may experience difficulties in accessing fibre services in some areas in the northern and eastern parts of Singapore. Our engineers are working hard to resolve the issue. We apologise for the inconvenience and will provide updates as soon as possible.

System Disruptions

System Disruptions

Power Reliability

mobile network disrup
ral areas of Singapore
investigations indicated that the disruption was due to a "power-related
gtel said.
Singtel

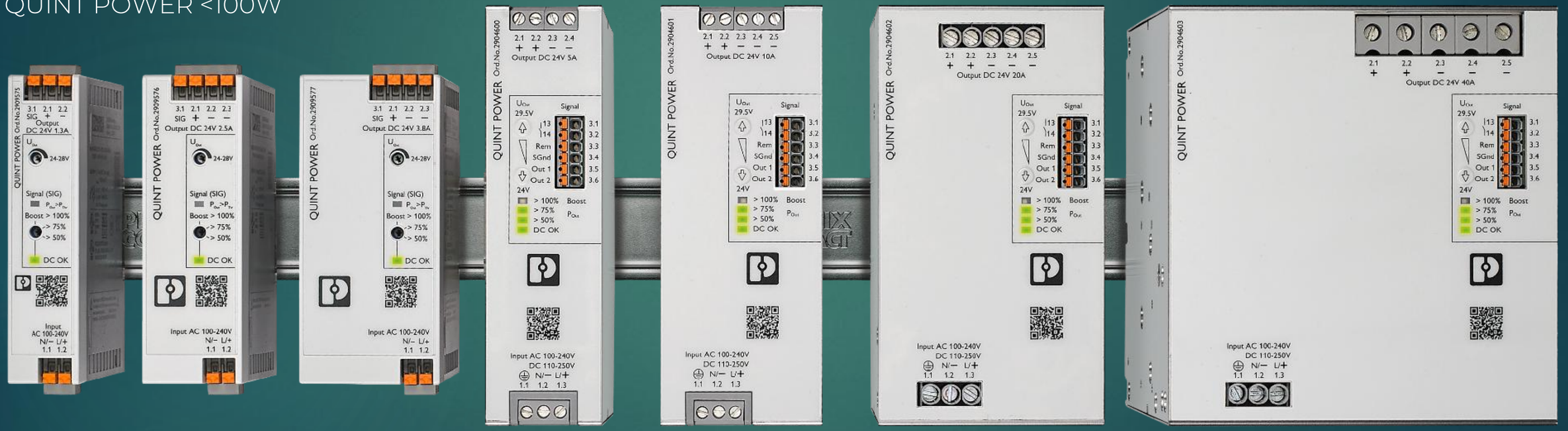
Quint-4 Power Supply

Communicative Quint Power

Communicative Integration
IO-Link, Profinet, EtherCAT
EtherNet/IP, Modbus

QUINT POWER <100W

QUINT POWER with 40A



1PH and 3PH

Push-in and Screw

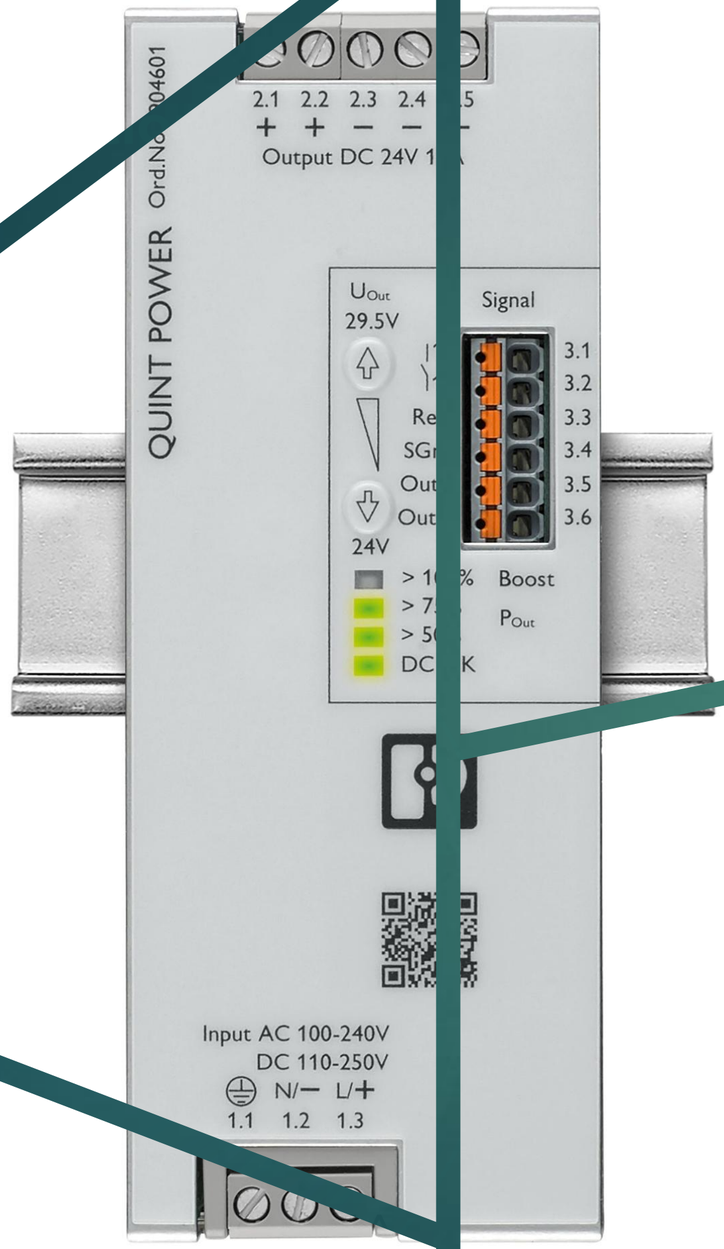
QUINT POWER **Plus**

Functional Safety (IEC 61508)

NFC Configurable

DO/AO/Relay/Remote

QUINT-4 Power



Static Boost

Up to 25% capacity expansion

High electrical Immunity

Integrated MOV and GDT protection (up to 6kV)

SFB Technology

Up to 6x nominal power for fault isolation

Comprehensive Signalling

Analog, Digital, Relay, Bargraph

Shock an Vibration

EMI and EMC Conformity
Shipbuilding DNV GL, ABS

Dynamic Boost

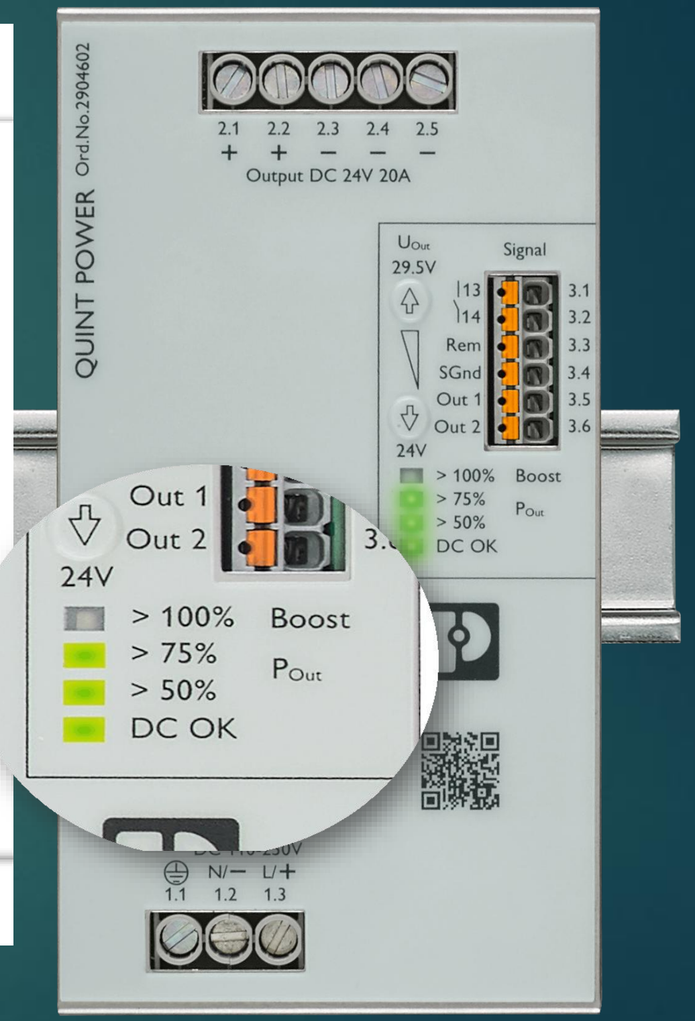
Up to 200% nominal power (5s) for starting heavy load

NFC Configurable

QUINT POWER APP

QUINT-4 Power

Default settings		Out 1 digital	Out 2 digital	Out 2 analog	13 14 Relay	Bargraph
Output voltage	V	●	○	○	●	
Output current	A	○	○	○	○	
Output power	P	○	●	○	○	●
Operating hours	0 0 0 0 h	○	○		○	
Prewarning derating	ϑ	○	○		○	
Overvoltage protection	OVP	○	○		○	
Input voltage OK	AC_{OK}	○				
Phase monitoring	$3AC_{OK}$	○	○		○	



QUINT-4 Power

PHOENIX CONTACT
INSPIRING INNOVATIONS

Read via NFC

New Configuration

Configuration

Device Data
QUINT4-PS/1AC/24DC/20/+

Output Voltage
Output voltage = 24.1 V

Characteristics
U/I Advanced

Signaling
Out 1: High if Uout > 90%
Out 2: High if Pout < 100%
Out 13/14: closed if Uout > 90%

Control Input
Power supply on if input open

NFC

Device data

Device designation
QUINT4-PS/1AC/24DC/20/+

Order number
2904617

Serial number
29046170019O9T0009

Revision
0

Manufacturing date
Week 9/2019

Last operating time
0.0 hours

Total operating time
0.2 hours

Device identification

Signaling

OUT 1 | OUT 2 | OUT 13/14

Output High

if

Output voltage
Output current
Output power
Operating hours
Temperature OK
Input voltage OK
Overvoltage Protection

21.7 V)

Signaling

OUT 1 | OUT 2 | OUT 13/14

Analog output

Output voltage
Output current
Output power

W

End value for 20 mA
480

W

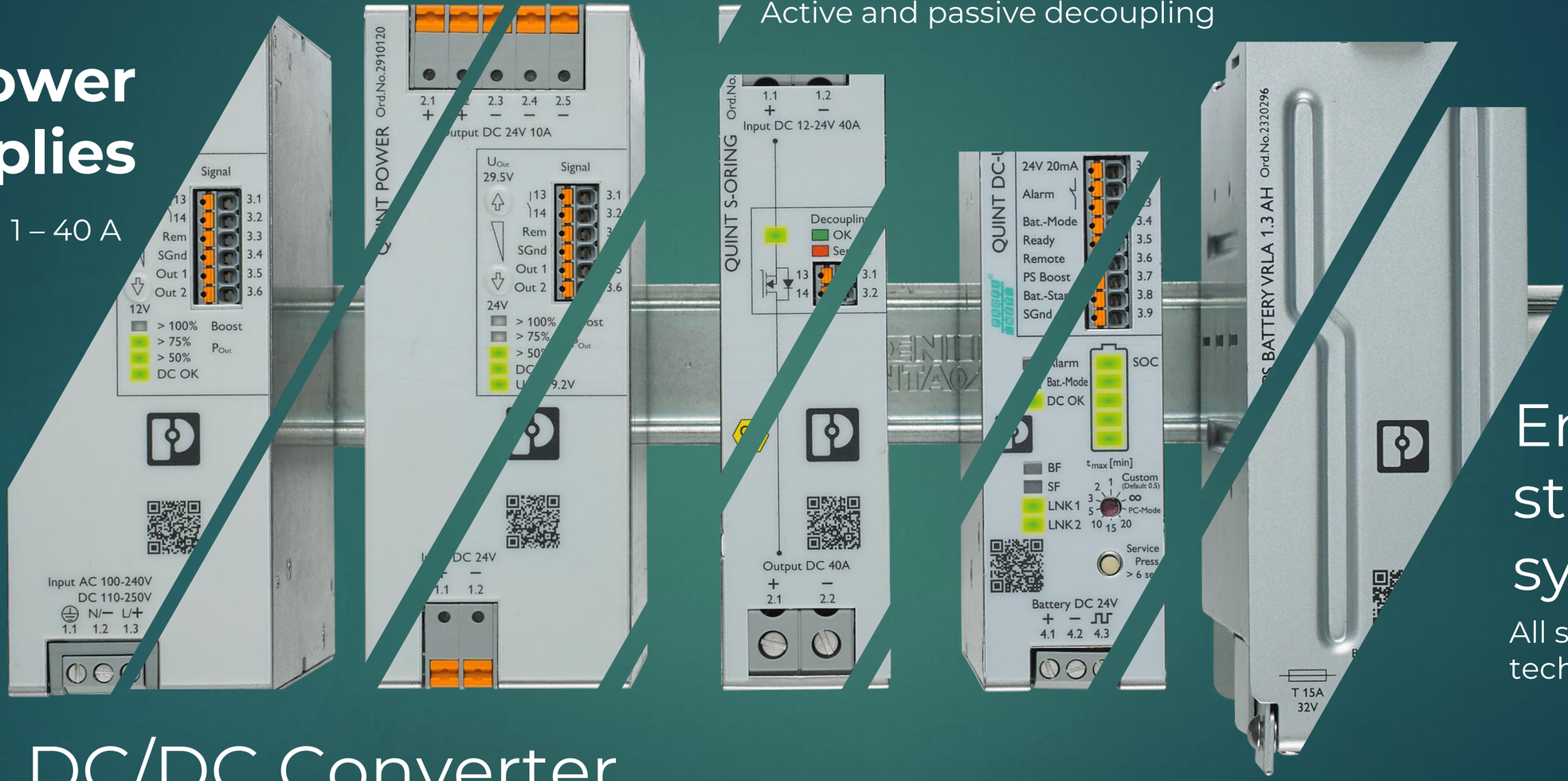
QUINT-4 Power

Power Supplies

1 – 40 A

Redundancy modules

Active and passive decoupling



Energy storage systems

All storage technologies

DC/DC Converter

All voltage levels

Uninterruptible power supplies

All industrial interfaces

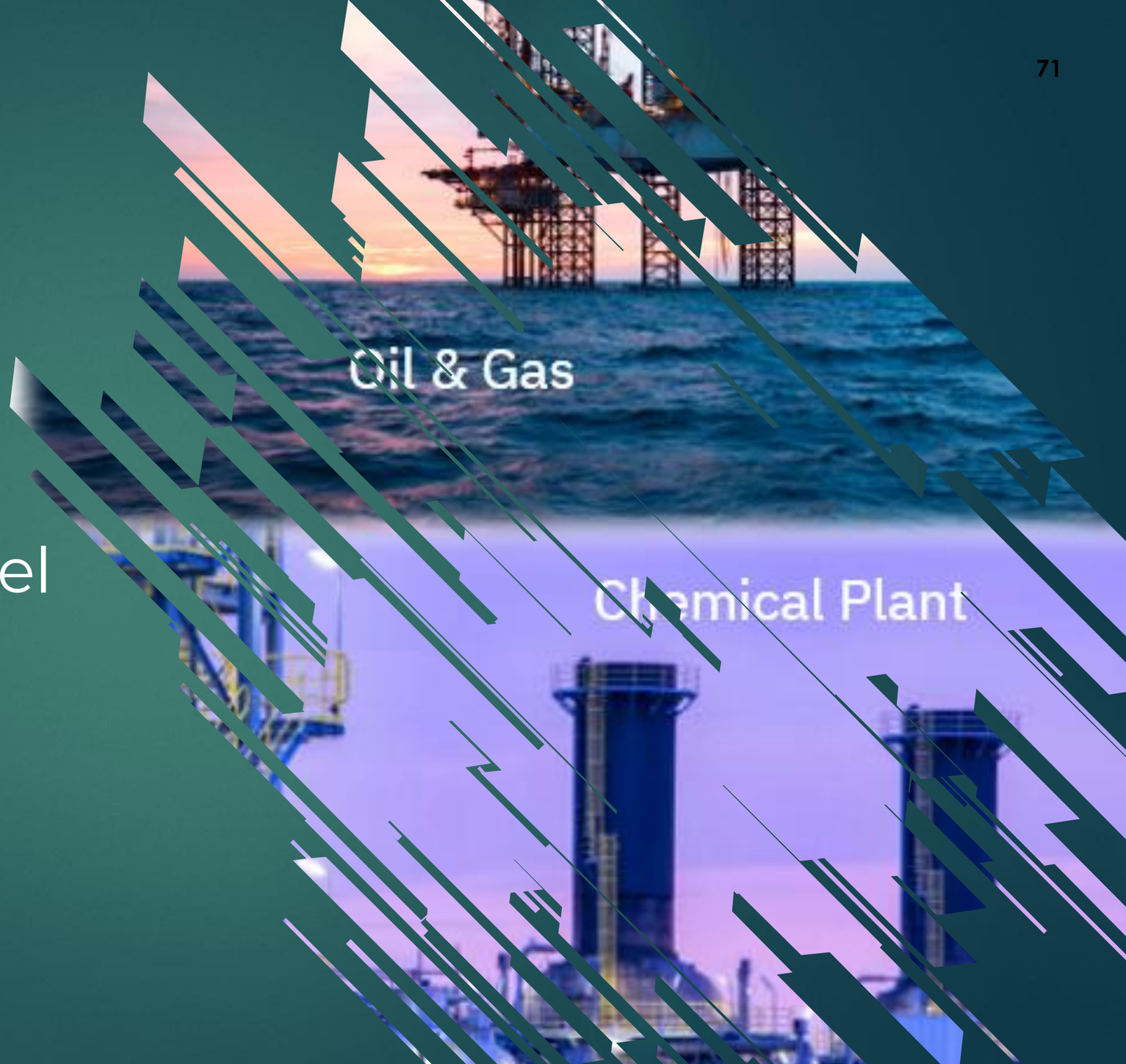
QUINT-4 Power

Shipbuilding

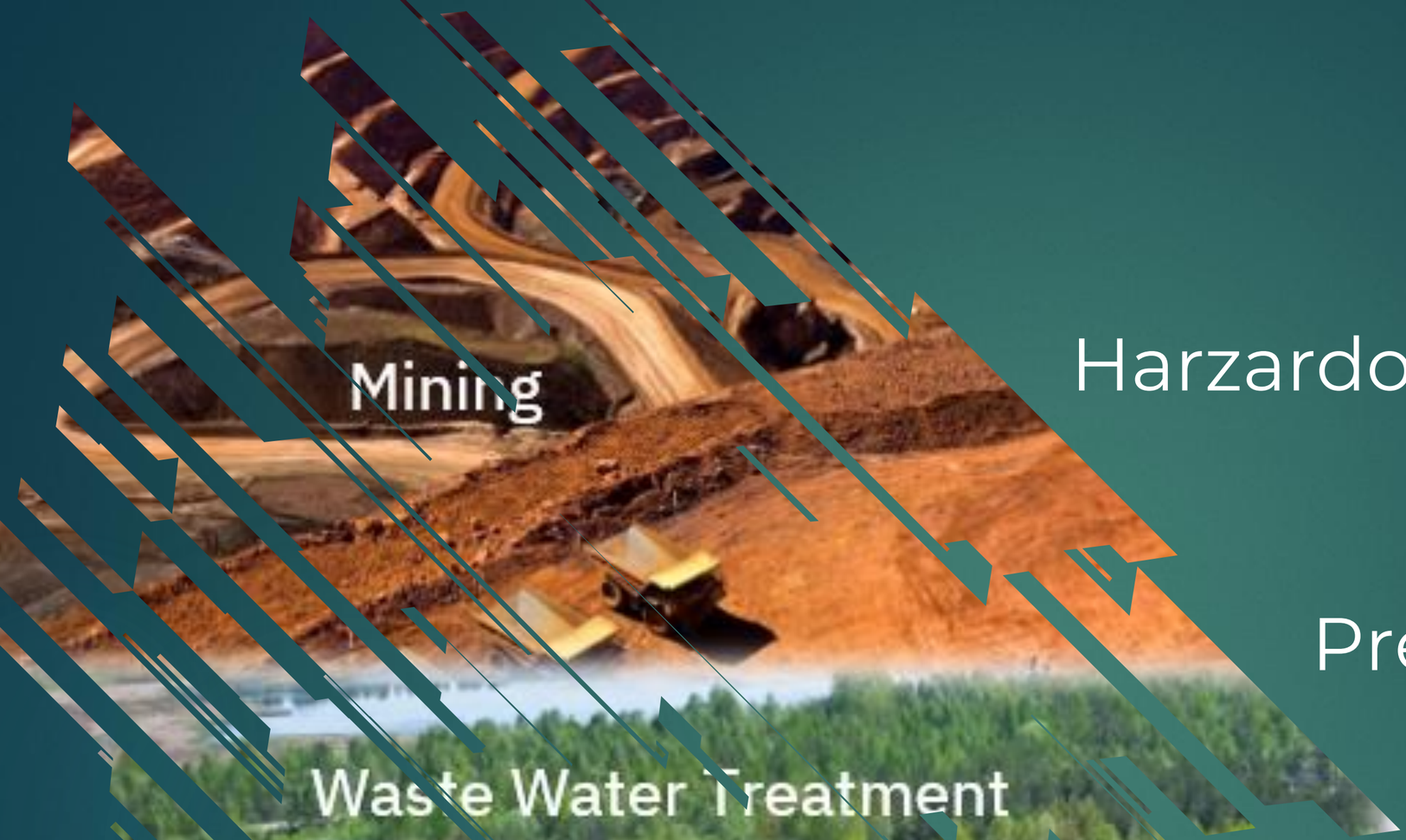
DNV, ABS, BV, LR, NK

Safety Integrity Level

IEC 61508, IEC 61511, SIL 2, SIL 3



QUINT-4 Power[72]



Harzardous explosive area

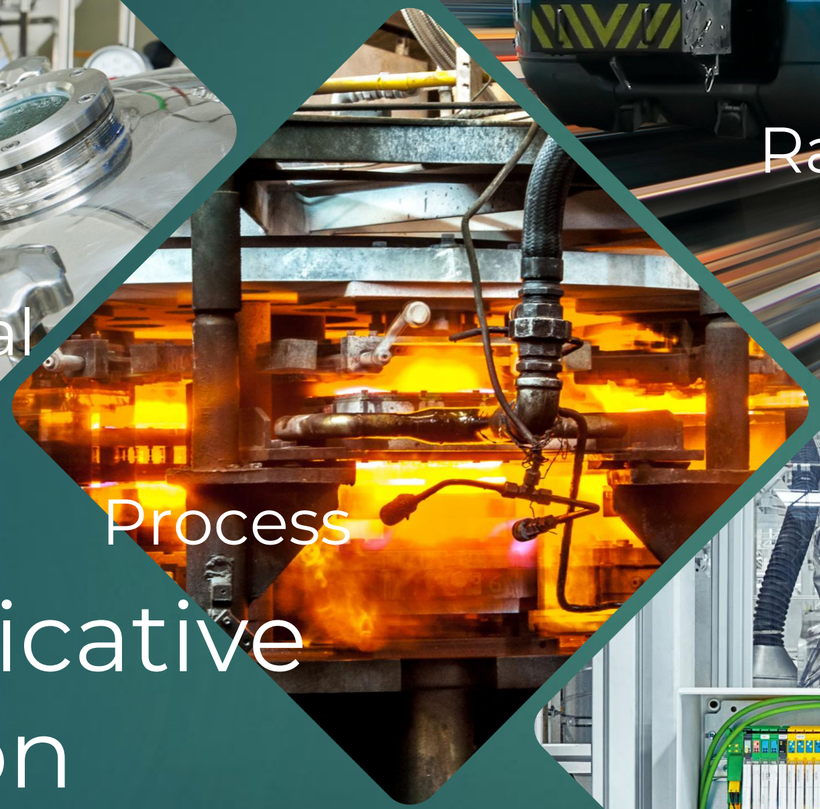
ATEX, UK-EX, IECEx

Preventive function monitoring

Transparency operating data

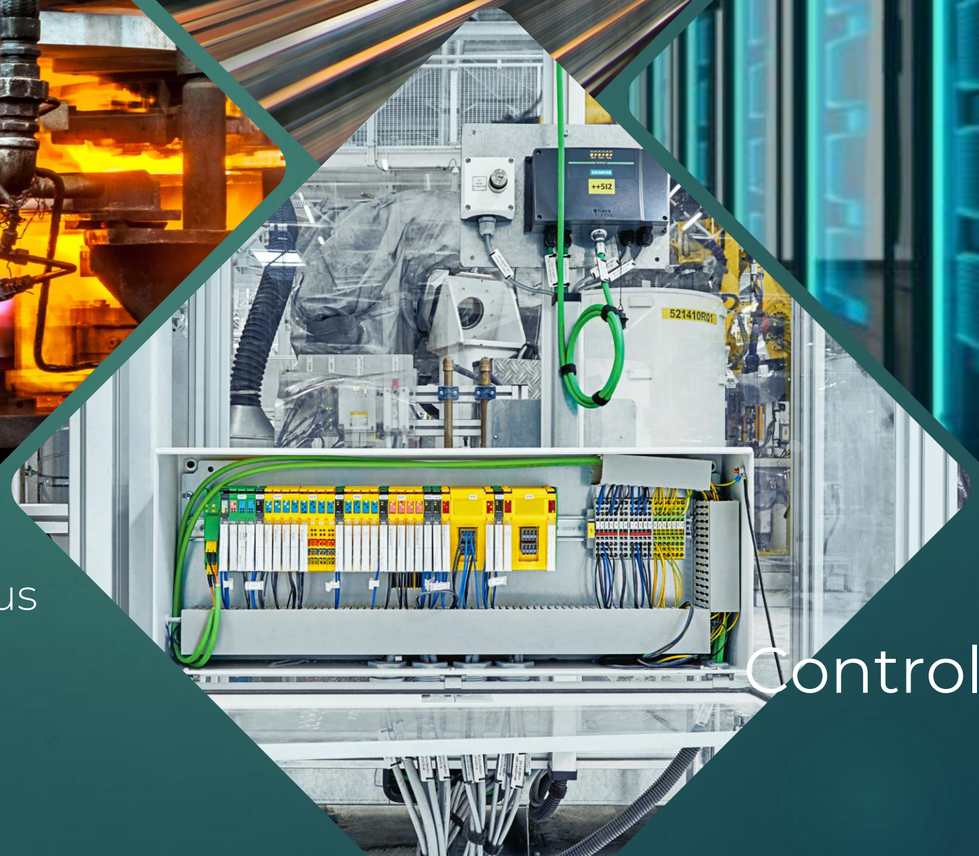
QUINT-4 Power

Pharmaceutical



Process

Railway



Control System

Data Centre

Communicative Integration

IO-Link, Profinet, EtherNet/IP, EtherCAT, Modbus

SEMI F47-0706

TRIO3 Power

Excellence and Performance beyond limitations

ROBUST
PROTECTION

ENERGY
EFFICIENT

CONTINUOUS
POWER

INTELLIGENT
MONITORING

TRIO3 Power 75

1PH & 3PH
Accept AC and DC input

Dynamic Boost
Up to 150% nominal power (5s)

Push-in
Reduced depth/width, stackable

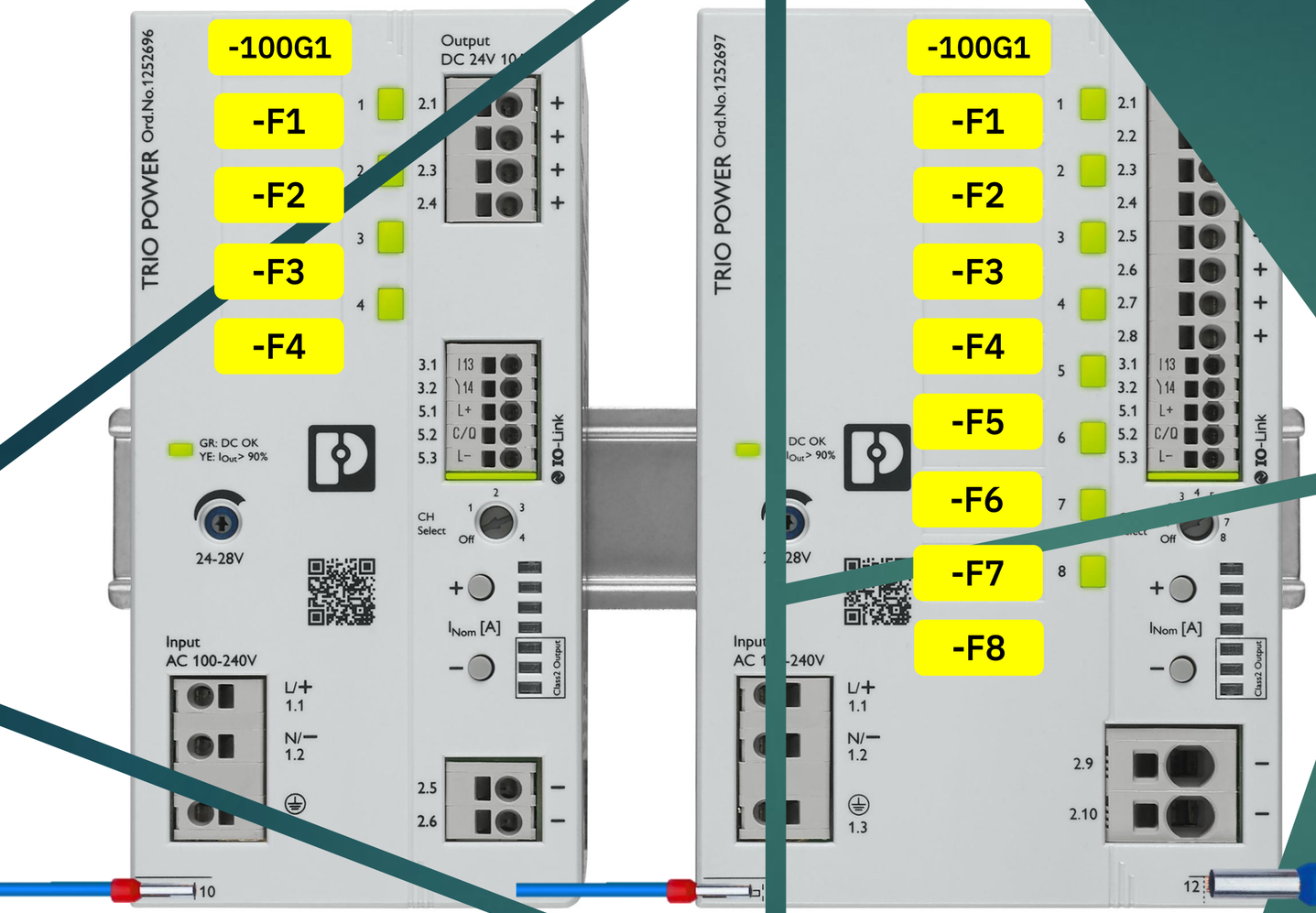
Tamper proof option
Standalone Overload

Marking field, Strip marking

Approval package, DNV

Multicolor LED, Relay

TRIO3 Power 76



SPACE SAVING
Integrated Circuit Breaker

SEMI F47-0706
Approval package, NEC Class 2

Easy Handling

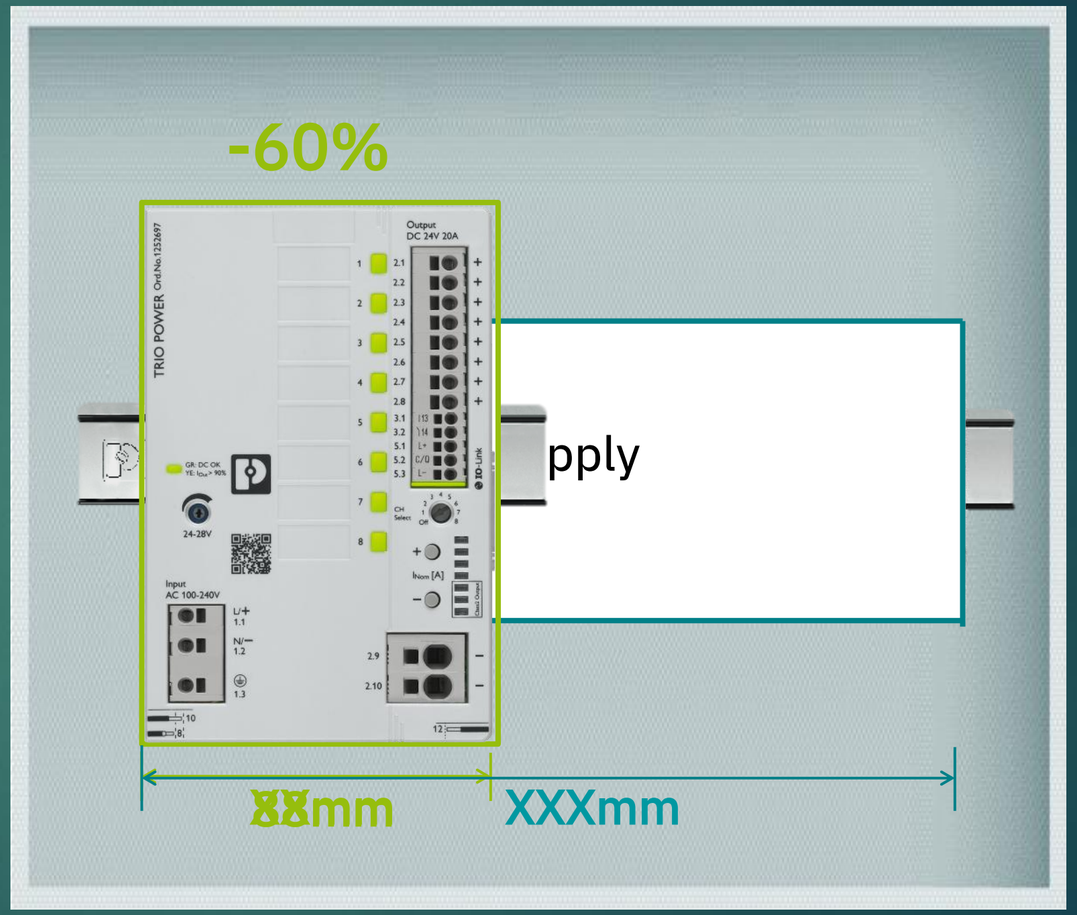
Short-circuit isolation

1PH & 3PH
Accept AC and DC input

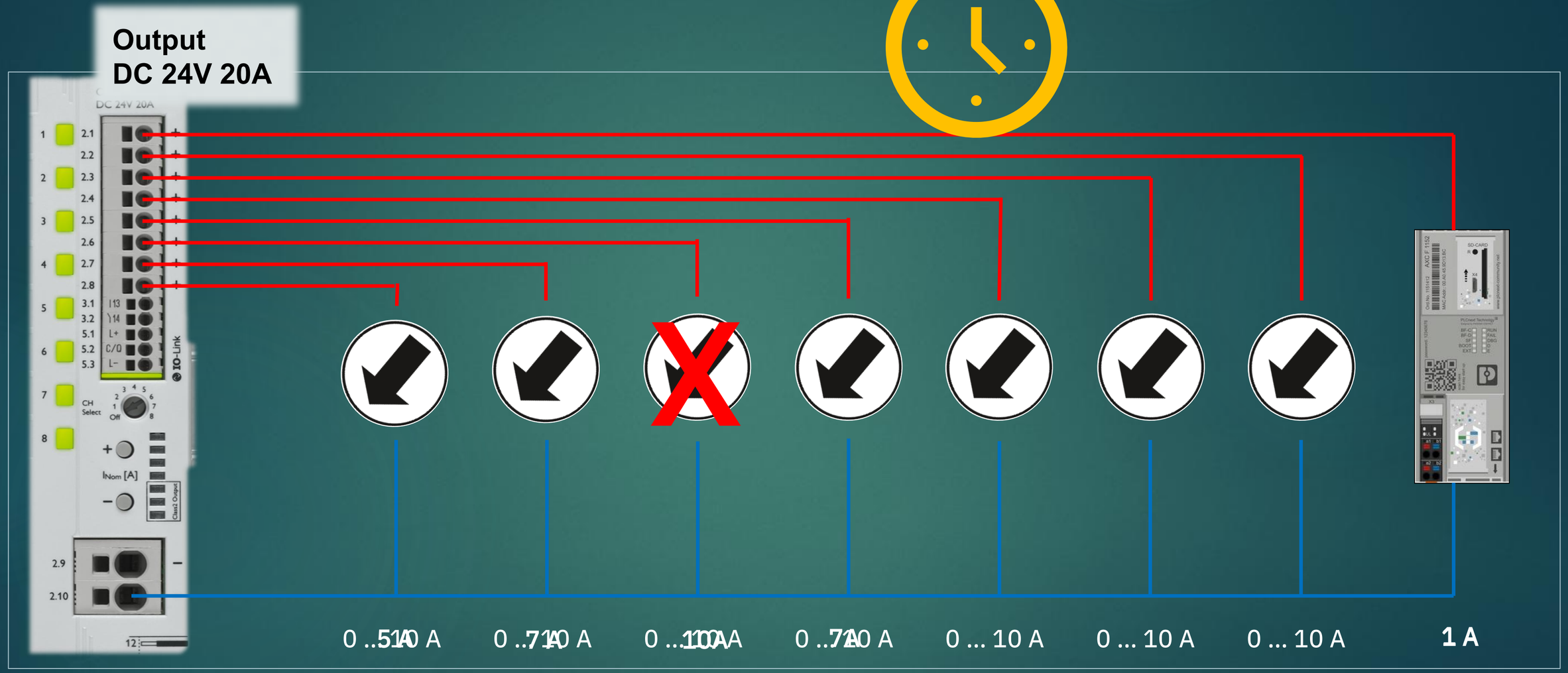
IO-Link
monitoring, controls, configuration, prioritization

Smart Diagnosis
Mulitcolor LED, relay contact, remote

TRIO3 Power [77]



TRIO3 Power


Output
DC 24V 20A
0 ... 10 A
0 ... 10 A
0 ... 10 A
0 ... 10 A
0 ... 10 A
0 ... 10 A
0 ... 10 A
1 A
Overloading!

PHOENIX CONTACT

Help

AKTIVIEREN

TRIO POWER 3rd Generation

TRIO3-PS/1AC/24DC/20/8C/IOL - Power supply unit - COCKPIT

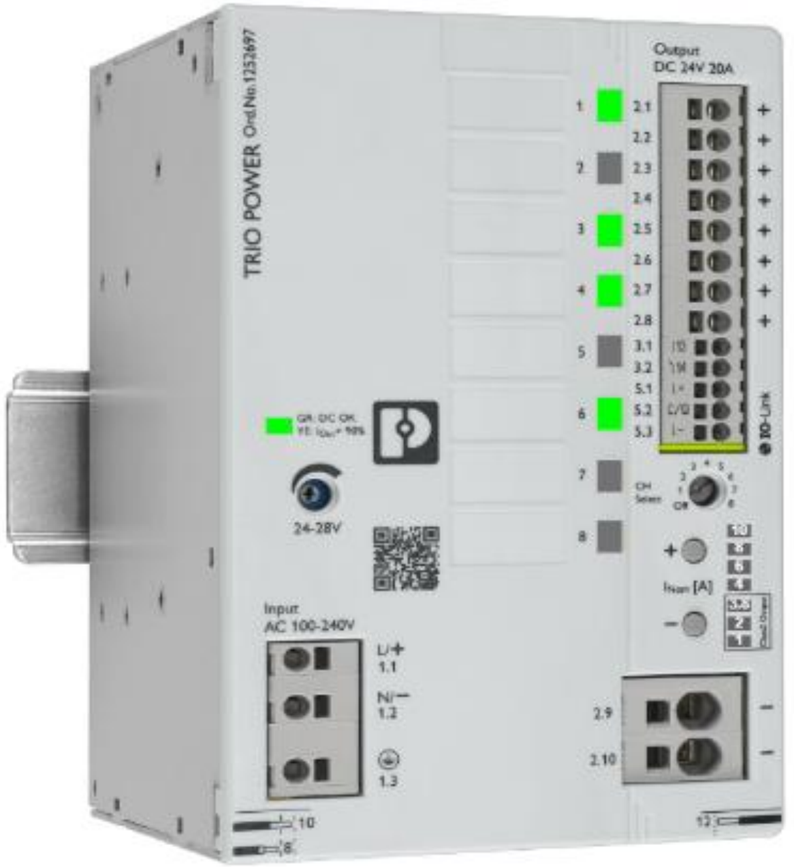
Device status

Output voltage: 24.1 V

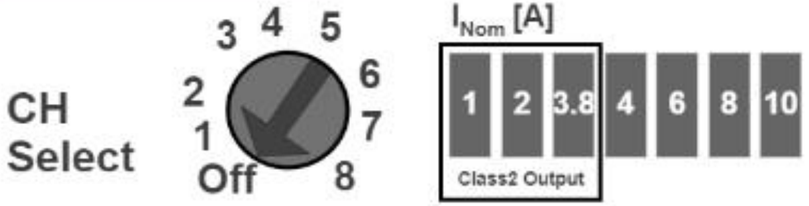
Sum output current: 0.0 A

Output power over 90%: NO

DC status: DC OK



Nominal current



Diagnose Function block is activated and initialized

Channel status

ON	CHANNEL 1	INom 4.0 A	ILoad 0.0 A
OFF	CHANNEL 2	INom 4.0 A	ILoad 0.0 A
ON	CHANNEL 3	INom 1.0 A	ILoad 0.0 A
ON	CHANNEL 4	INom 2.0 A	ILoad 0.0 A
OFF	CHANNEL 5	INom 8.0 A	ILoad 0.0 A
ON	CHANNEL 6	INom 3.8 A	ILoad 0.0 A
OFF	CHANNEL 7	INom 3.8 A	ILoad 0.0 A
RESTART	CHANNEL 8	INom 2.0 A	ILoad 0.0 A

All channels

ON | OFF | Remote reset

TRIO3 Power 80

Robotics

Cabinet Building

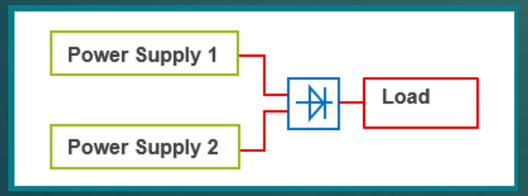
Machine Building

Factory Automation

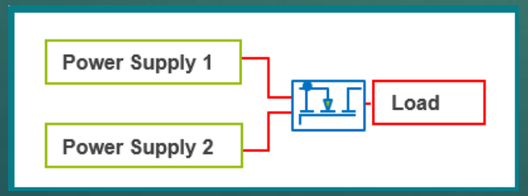
Intralogistics

Redundancy Modules

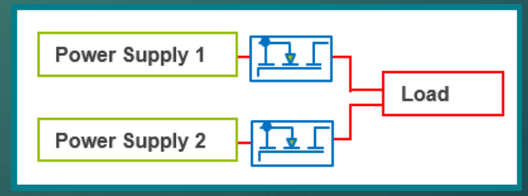
DIODE



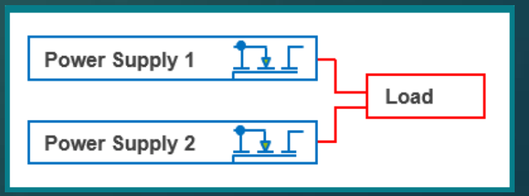
O-RING



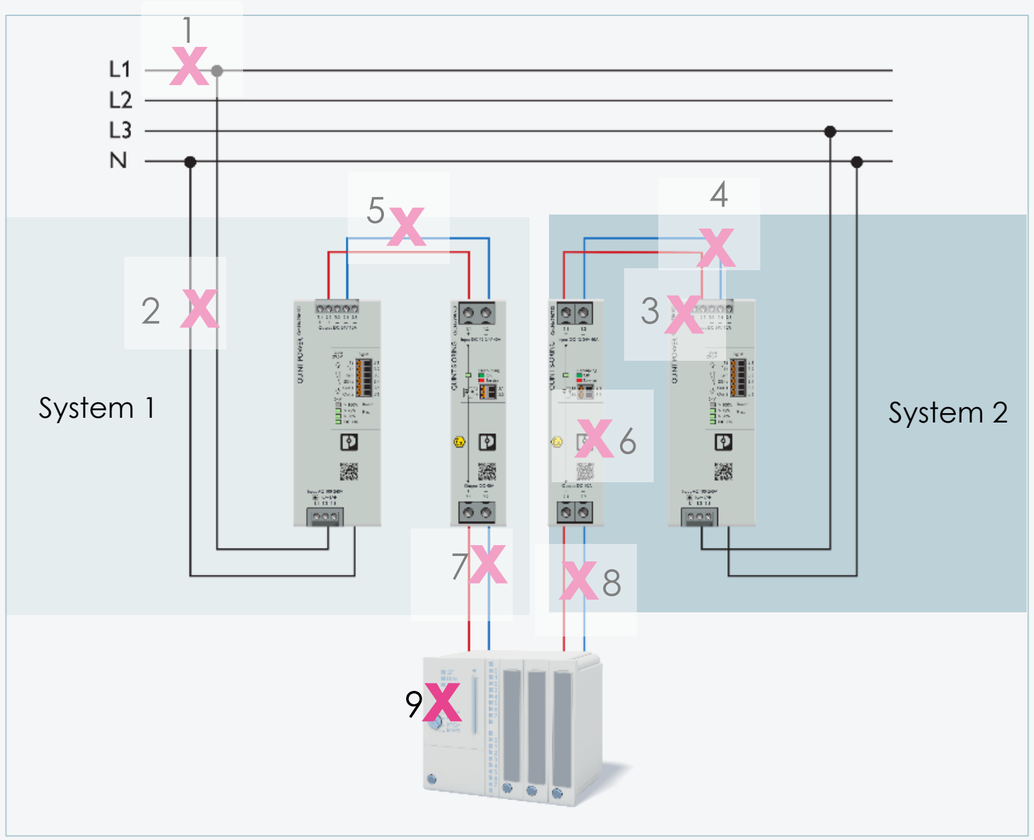
S-ORING



QUINT4-PS+



Redundancy Modules



	Error	System 1				System 2			
		Signaling of the power supply		Signaling of the redundancy module		Signaling of the power supply		Signaling of the redundancy module	
		Relais 13/14 (see step 4)	LED DC OK	Relay 13/14	LED	Relais 13/14 (see step 4)	LED DC OK	Relay 13/14	LED
	Normal operating mode	Closed		Closed		Closed		Closed	
1	Error in one phase	Open		Open		Open		Closed	
2	Power line of power supply is interrupted or short circuited	Open		Open		Open		Closed	
3	Error of one power supply	Open		Closed		Open		Open	
4	Short circuit between power supply and redundancy module	Open		Closed		Open		Open	
5	Interruption between power supply and redundancy module	Closed		Open		Open		Closed	
6	Error of one redundancy module	X		Closed		X	X	Open	
7	Interruption between redundancy module and load	Closed		Closed		Open		Closed	
8	Short circuit between redundancy module and load	Open		Closed		Open		Open	
9	Load current is too high for one power supply	Open		Closed		Open		Closed	

Redundancy Modules

QUINT-4 Power – PLUS

Integrated decoupling MOSFET

Maximizing system availability

1+1 and n+1 redundancy

Double OVP

Protective coating

Protect against dust, corrosive gases and 100% humidity

ATEX +IECEx approval

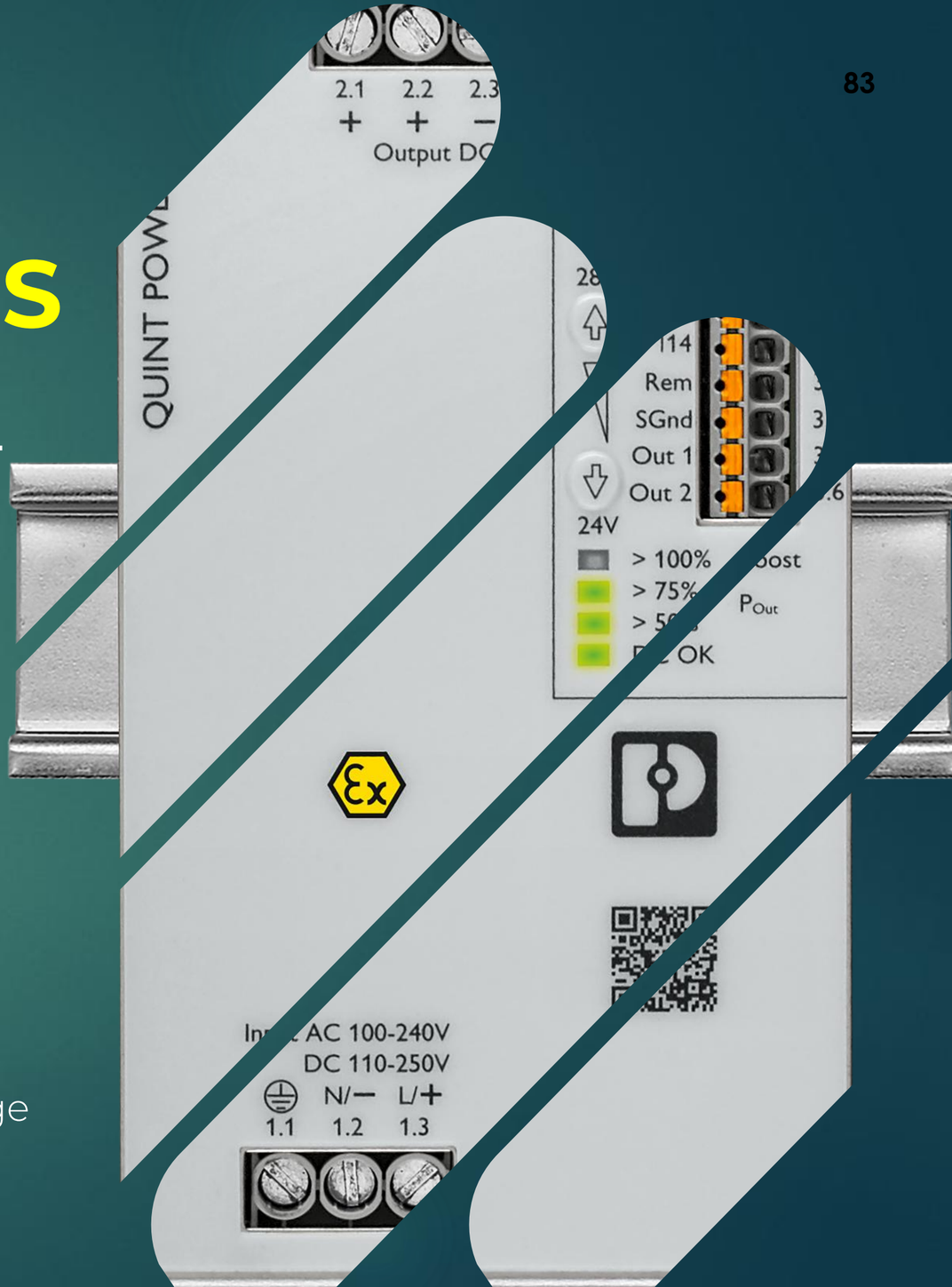
For use in potentially explosive areas of zone 2

SIL 3 certification

Maximizing operational safety integrity

Wide temperature range

-40°C to +75°C



Uninterruptible Power Supplies

Continue deliver power in the events of mains failure

Modular solution

Tailored to application

Remaining life expectancy

Warning failure at early stage

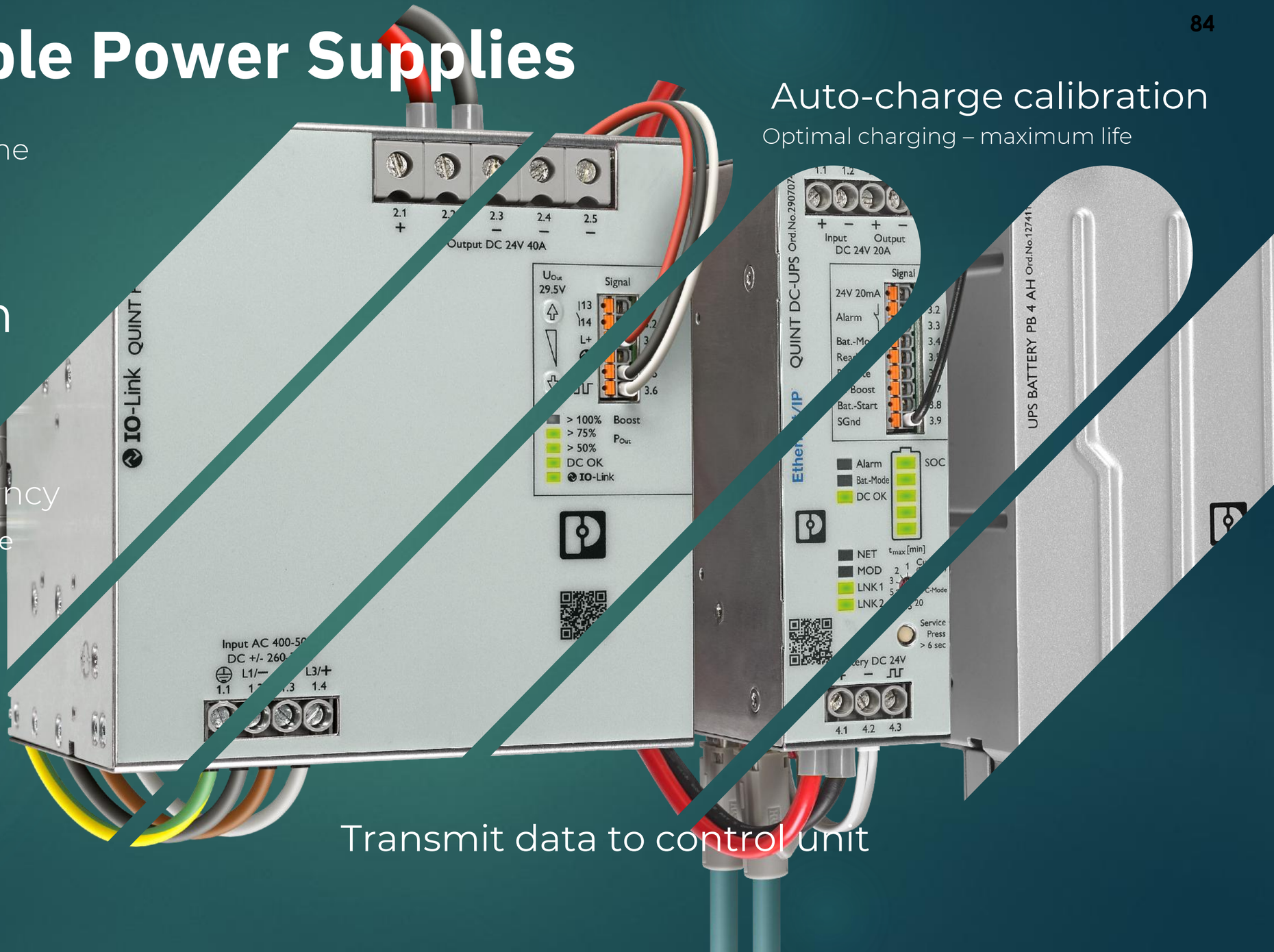
IQ technology

State of Charge

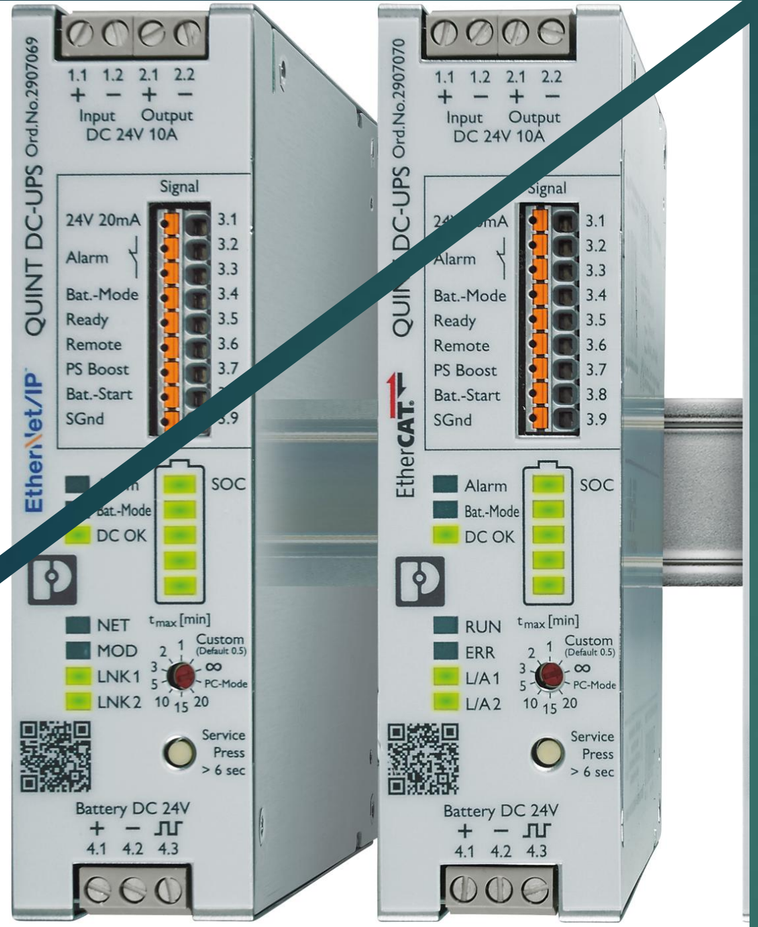
State of Health

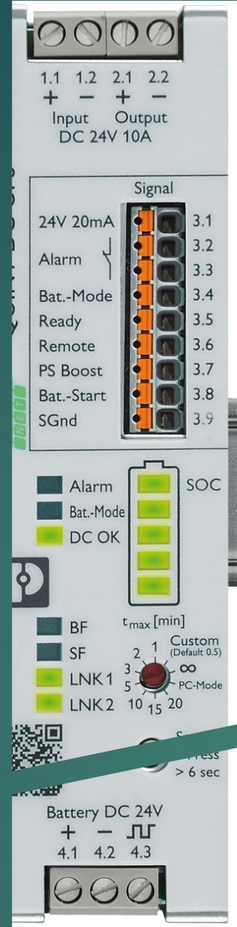
Auto-charge calibration

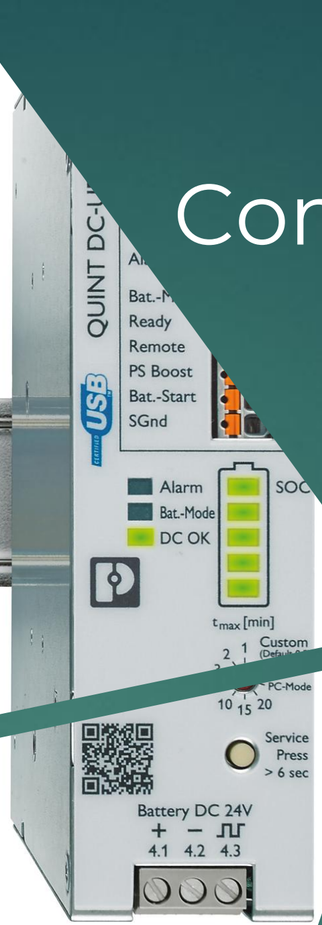
Optimal charging – maximum life

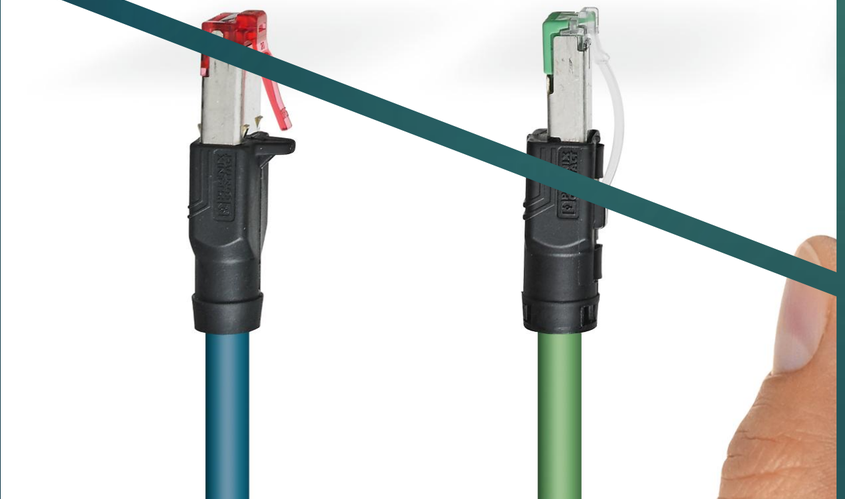


Transmit data to control unit









Comprehensive signalling

Digital, analog, Float
Parameterization (Data port)

SOH (Alarm; BAT; Ready)

SOC (Battery management; Bargraph)

Optimal charge
Fast charge
Runtime monitoring

Output current

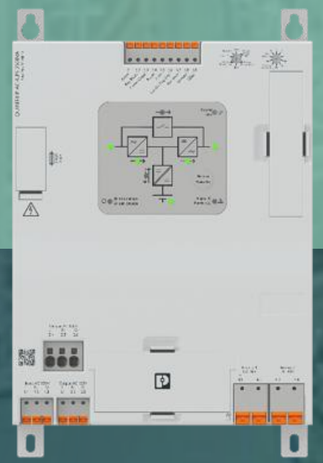
5A to 40A

High efficiency >97

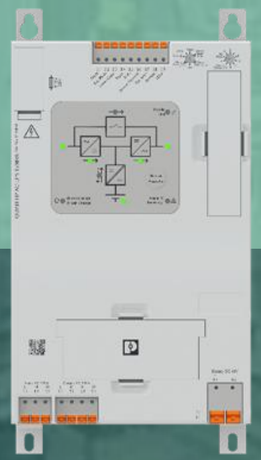
Power Management Suit

Uninterruptible Power Supplies

Panel Mount



2.5kVA UPS
2250 Watt



1.5kVA UPS
1350 Watt

DIN rail

1kVA UPS
900 Watt

500VA UPS
400 Watt

Uninterruptible Power Supplies

Securities System

Gantry System

Farming and Agriculture

Gate

Control and Monitoring

Fresh air ventilation

Lift, lighting and alarm system

Plant Operation

Circuit Breaker

Electronic
Single Channel
breaker

Electronic Multi Channel breaker

Thermal Magnetic
Single Channel
breaker

Circuit Breaker

Stable supply voltage

Fixed Rating
Adjustable Rating

Overload Protection

Push-in
Connector

Isolated protection

Multicolor LED
Indicator, configurator, switch

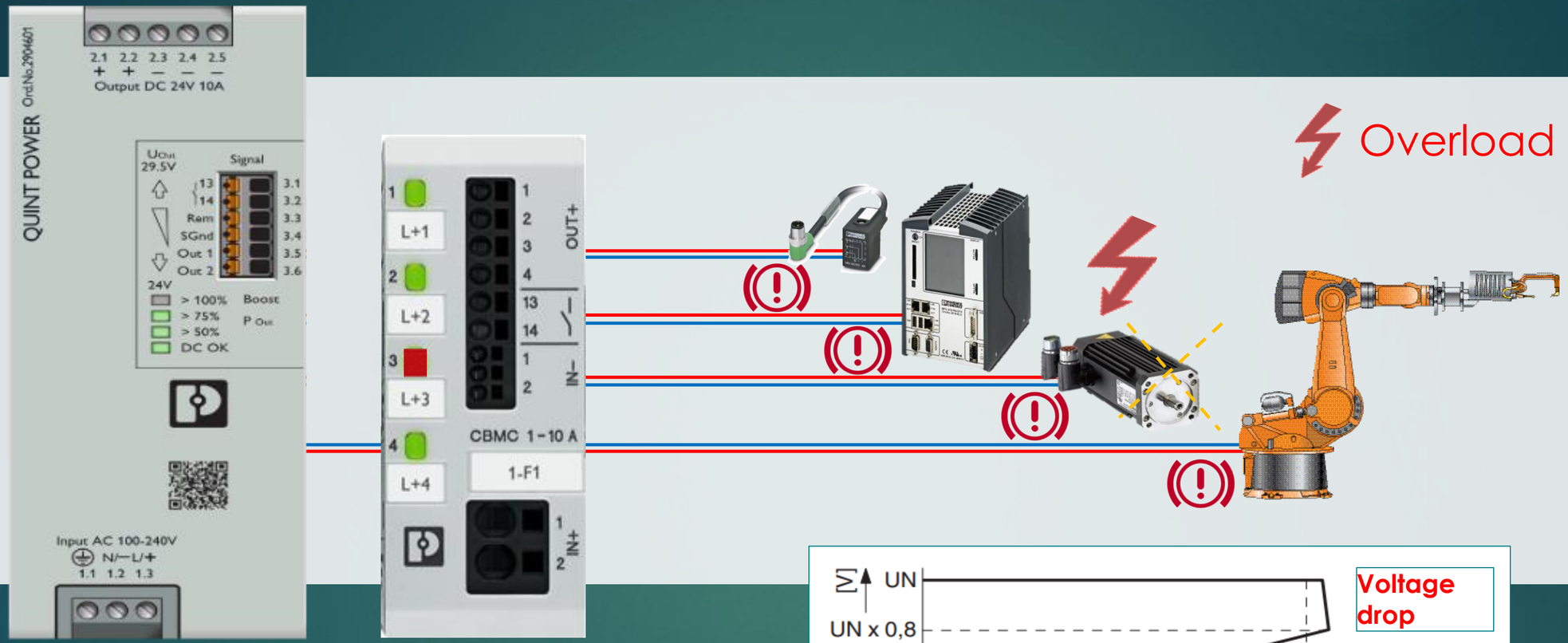
Short Circuit Protection

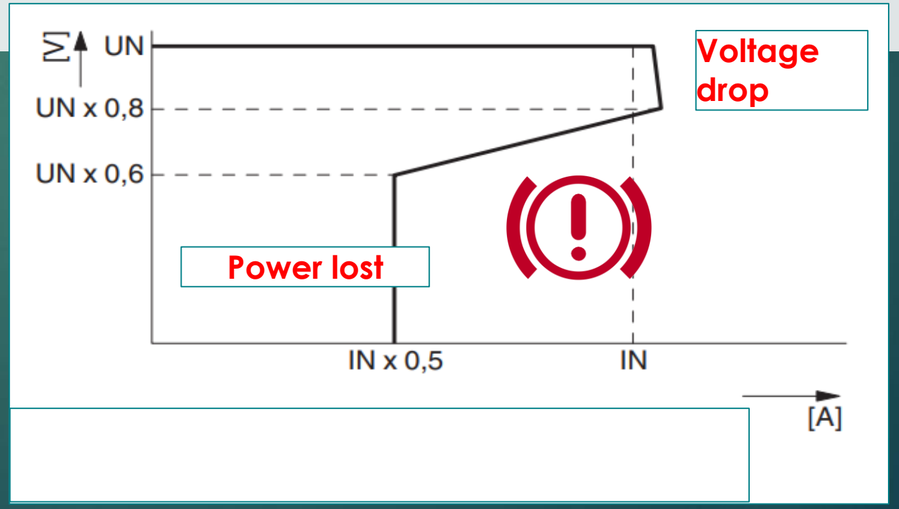
Selective Configuration

IO-Link
monitoring, controls, configuration

Relay Contact

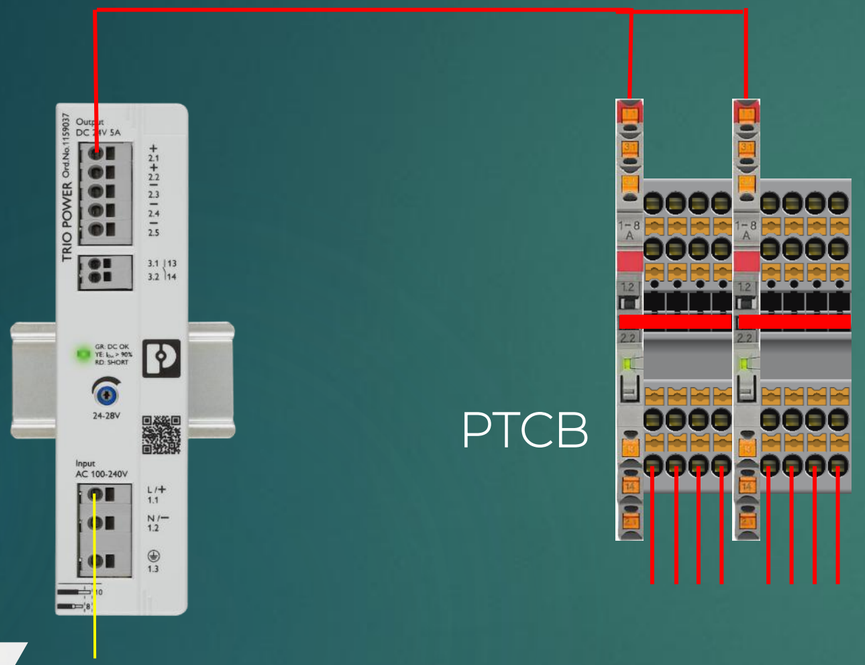
Circuit Breaker



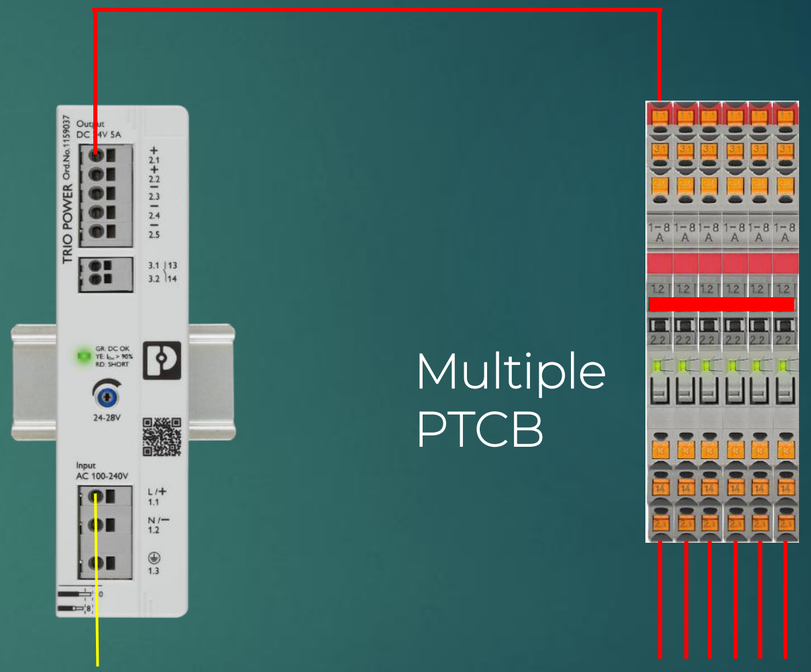


Circuit Breaker

- Device protection and potential distribution with CLIPLINE Complete



- Selective single fuse per load



Space-saving and clear structure

PTCB – Multi-level status display

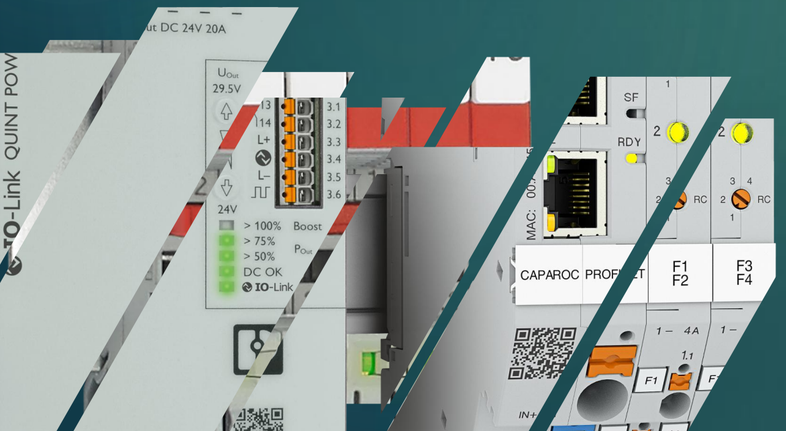
LED for status display

Green: Channel switched on
Yellow: Channel load >80%
Red: Channel switched off / error

Fast detection

Operating status

Selective and configurable protection



Circuit Breaker

Power module

4-Channel breaker

1-Channel breaker

2-Channel breaker

0V potential distributor

Scalable

Flexible

Expandable

Replaceable

Current Rails

Safe supply up to 45A power

Selective Configuration

Communication Option

Ethernet/IP
Profinet
IO-Link
Modbus TCP
EtherCAT

Multicolor LED

Indicator, configurator, switch

Easy Operation

Hot-swappable

Circuit Breaker

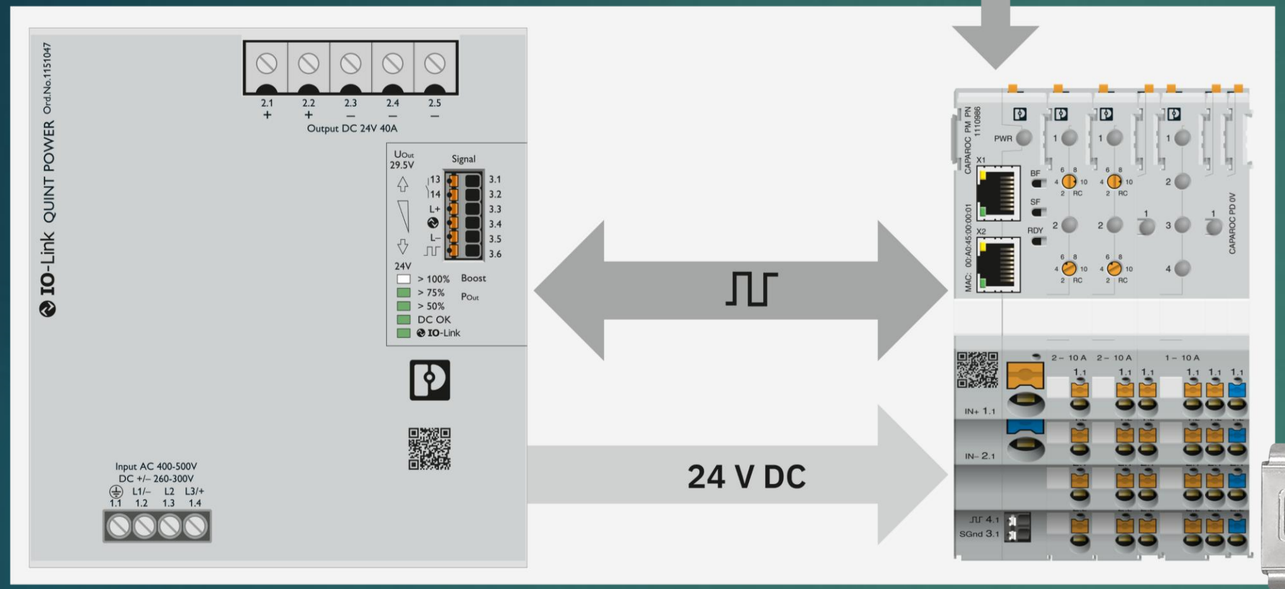
Caparoc

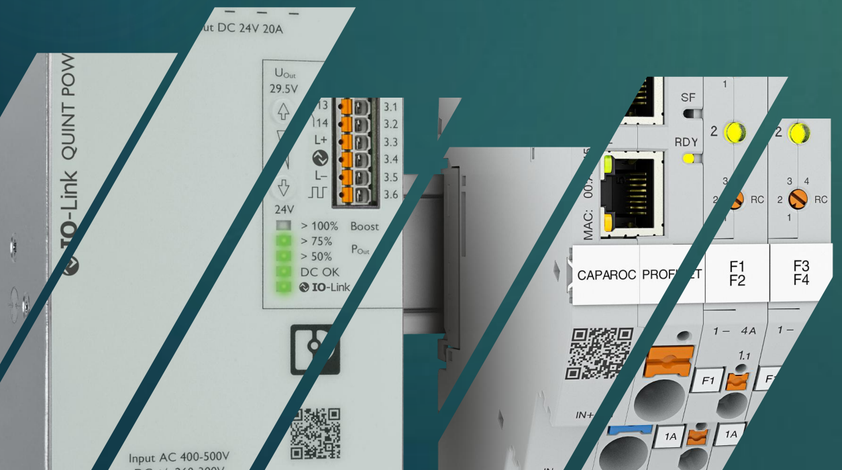
Intelligence circuit breaker

PROFINET®

EtherCAT®

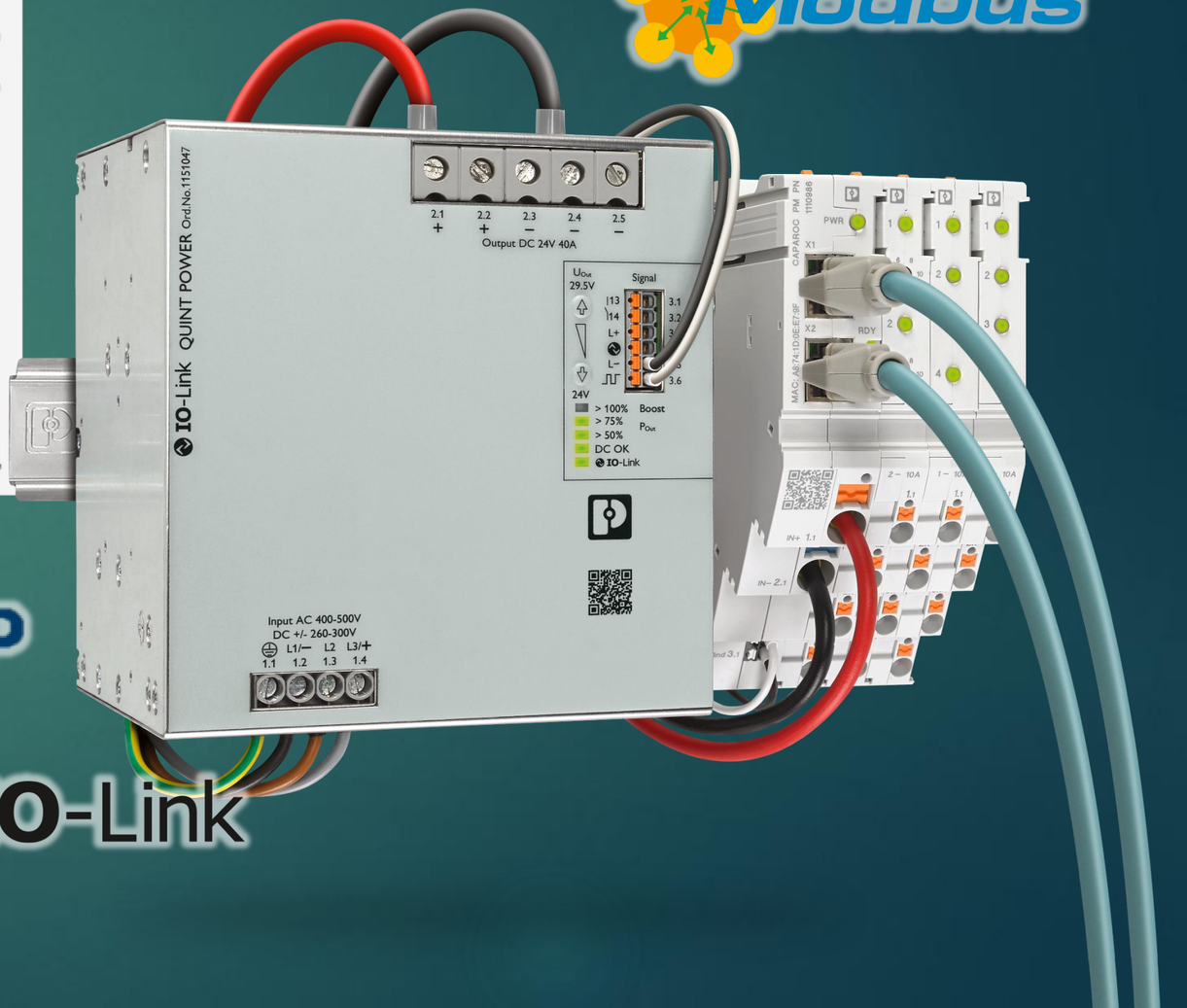
Modbus



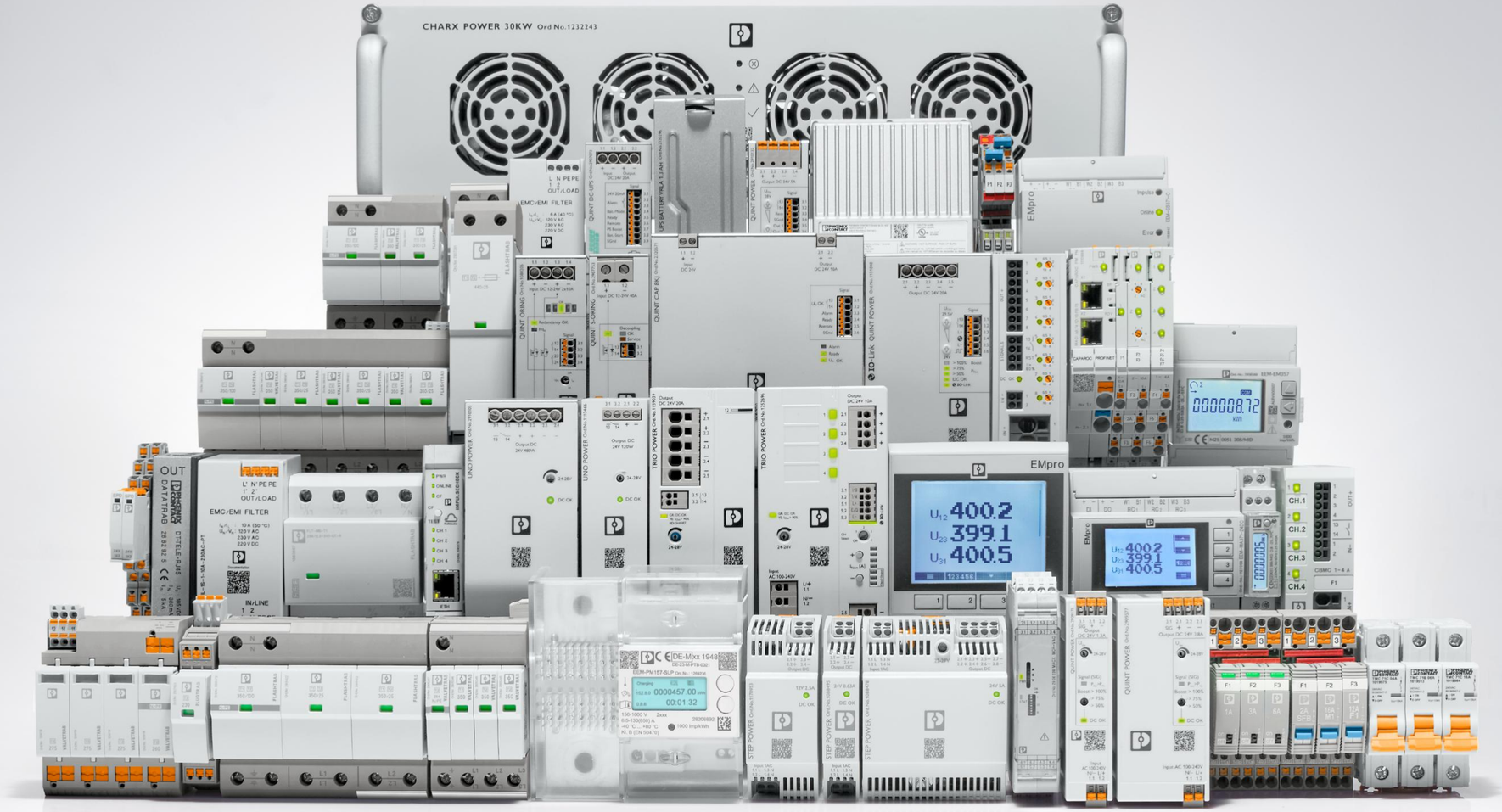


EtherNet/IP

IO-Link



PROA Re-defined



PHOENIX CONTACT SOUTHEAST ASIA

INSTITUTE OF INTEGRATED ELECTRICAL ENGINEERS 1975

SINGAPORE CHAPTER 2011

ENGINEERING *RESILIENCE*

Enabling Industries through Innovation